the OIL AND GAS JOURNAL

MARCH 18, 1957

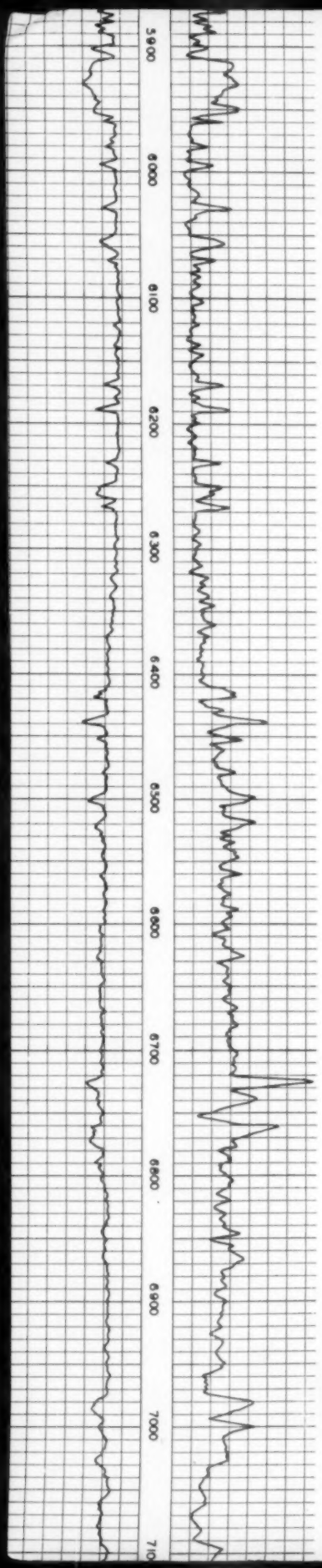
Beginning a new series on

Refining Techniques

Actual case histories of how plants solved worrisome problems in processing p.110

Oil Hits Back . . .

Here, in a 16-page report, Journal editors answer critics of the oil industry's recent price increase. And they show what the industry is doing in spite of prices that are still not in line with mounting costs. Facing p. 108



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JOURNAL News Letter

March 18, 1957
Tulsa, Okla.

Dear Sir:

Expect the fate of any natural-gas bill this session of Congress to be settled within a few days. In fact, the fight may die before it starts.

This much is known: A bill releasing independent natural-gas producers from federal price regulation has been drafted and is in final form. But its friends in Congress won't even introduce the bill without an outspoken endorsement from the White House and promise from the President he will sign it. Word is that unless this Eisenhower support comes in the next few days the whole issue will be dropped. Congressional leaders figure time is running out on the bill.

Europe's threat of oil shortages is fast fading. But oil experts are advising European nations to take it easy on lifting oil restrictions. There are two good reasons: The Middle East is still a political tinderbox... Oil stocks in Europe at the end of March will total only 3-1/2 weeks supply.

Authorities also give this outlook: Supplies between April and June should equal 94 per cent of Europe's normal demands even with the Syrian pipeline and Suez closed. This will be improved now that the pipeline is moving 40 per cent of capacity and prospects are good for opening the canal to big ships earlier than predicted. Saudi Arabia even has lifted its ban on oil shipments to England and France. So Europe is being told to take advantage of these rising imports to build up its stocks (P. 86).

Meanwhile, the Senate probe into the European oil lift will resume this week. Some surprise witnesses may be on tap. This is hinted in requests from some "integrated oil interests" to testify. The interests have not been named but they are understood to be outside the Middle East Emergency Committee.

Oil is still a hot item on other WASHINGTON fronts. Here's a quick rundown: An early decision is in sight on return of Texas Eastern Transmission's Little Inch pipeline to oil service... Navy officials will lay plans before a House committee this week for research on producing heavy fuel oil from shale... Cost of regulating independent gas producers has reached $900,000 annually and is rising... Independent oil men and most congressmen have agreed on at least one issue: They oppose further delay in drafting a program to control oil imports. Congress will be pressed to pass a quota bill unless the Government acts without delay. The question of increased domestic production due

to the oil lift will complicate the imports issue this time.

Speaking of imports: First tip on what's ahead may be given in Austin this Tuesday. The Texas Railroad Commission has invited top officials of all importing oil companies to appear and reveal their future plans on imports. A big turnout is expected. All hotels and motels were reported sold out for accommodations last week.

Other UNIONS are stepping up the tempo of their wage drives. They're on the spot since Indiana Standard settled for a 4 per cent raise with Whiting independents.

O.C.A.W. Chief Knight has written a letter to all his bargaining committees in the oil industry (P. 85). He ordered three moves to dislodge companies from their no-wage-increase stand. These include: Opening additional contracts wherever possible so maximum strength can be exerted in support of the campaign... Bringing increased pressure on companies... And taking of strike votes by all units with opened contracts.

Showdown is expected by end of April if companies do not make reasonable offer by then. O.C.A.W. says it's not changing its wage program despite Whiting deal.

Two big oil companies changed skippers last week: Hines Baker is leaving the presidency of Humble. He likely will get a spot on the Jersey Standard board. Morgan Davis is slated to succeed him... Sidney A. Swensrud is retiring as chairman of Gulf. No successor is contemplated. Gulf President W. K. Whiteford says company executive responsibilities will be realigned.

"Oil Hits Back" is the title of a 16-page special section of this week's Oil and Gas Journal. It's a fast-reading piece, backed up with charts, graphs, and statistics, giving oil's side of the hassle over prices and the Suez crisis. If you need arguments handy to answer oil's critics, they're spelled out for you.

PIPELINERS will get a chuckle out of this: The world's first coal pipeline has flunked its maiden operating tests.

A slurry of pulverized coal and water was pumped into the 10-in. line at Cadiz, Ohio. But only the water reached the next pump station. The coal was deposited somewhere along the way. Later not even the water would go through.

These troubles are expected to be overcome. Eagerly awaiting the outcome of the tests are: Pittsburgh Consolidation Coal, builder of the Cadiz-Cleveland line... And the railroads which are losing freight business to the line. If it performs according to top pilot tests, it will mean $1-a-ton saving in freight costs. But the railroads have options to buy stock in the pipeline.

The controversial Gulf-Coast oil pipeline may be nearer reality than many oil men think. Here's the tipoff: Mobilization Boss Flemming recently ruled that quick tax writeoffs may be given on "strategically located" pipeline

needed to fill "a special wartime requirement." Only the East Coast line falls into that class at the moment.

Add the 1,517-mile Texas-to-Florida gas pipeline to the list of projects available for contracting jobs this summer. Last barrier to the big-inch line has been cleared. F. E. Stanley, president of Houston Texas Gas & Oil, says work will start this summer with first gas deliveries in 1958. Besides the main line to be built by the Stanley firm and Coastal Transmission, there will be 1,000 miles of gathering lines for contractors to bid on.

First gas-combustion turbine ever installed on a major crude or products pipeline is now operating in Saudi Arabia. Aramco put the first of eight units on Tapline. They are designed for heavy-duty use in portable, unattended, auxiliary pump stations. Also they are key to boosting Tapline capacity to 425,000 bbl. daily by the end of the year.

EXPLORATION men can look for large-scale drilling operations to spring up soon in the Fezzan Province of Libya. The French strikes in the Sahara desert region of Algeria are making the whole area hot--and it isn't the weather. Two American majors--Jersey Standard and Socony--plan wells deep in the Libyan interior. Several other companies are applying for acreage in the area that was all but ignored only a year ago (P. 104).

Alaskan interests are pressing Congress to open up the territory's submerged lands to oil development. Alaska Delegate E. L. Bartlett claims encouraging formations have been found in the tidelands... Richfield may delay until mid-May its first test on the 71,680-acre Swanson River unit of Alaska's Kenai Peninsula due to spring thaws.

Prospects of Southwestern France's Aquitaine basin are picking up fast. A deep pool test at the east end of Parentis field blew out at 12,300 ft. and flowed wet gas. Meanwhile, a test drilling about 9-1/2 miles southeast of Dax encountered the basin's first productive sandstone (P. 106).

Eastern Peru's sprawling but little tested Amazon basin has its second discovery. A Peruvian company brought in the 500-bbl. daily well on the Ucalyali River, near Contamana, about 93 miles north of Pucallpa. Peru's only other discovery east of the Andes is Agua Caliente field 140 miles south of the new strike.

Kansas is holding its own as a happy hunting ground for independents. The reasons: Numerous pay zones at shallow depths... Acreage prices are low... New fields continually are being found... And geophysical survey success is good and inexpensive (P. 117).

Having trouble keeping good DRILLING crews despite high wages?

One Oklahoma contractor has found that generous fringe benefits turn the trick. He gives vacations, company-paid insurance and retirement, and promotes from within his organization (P. 145).

Universal Drilling plans a $3 million offshore barge for drilling in 120-ft. water. Key feature of the equipment is a double-locking hydraulic jack invented by the company's president, Louis J. Roussel, New Orleans oil operator.

The Gulf Coast's flotilla of three-legged offshore drilling barges is growing. One was completed last week and two more ordered at LeTourneau yards at Vicksburg. The finished barge was delivered to Zapata Off-Shore as a sister vessel to its famous "Scorpion."

PRODUCTION men will agree that operators in the prolific Anahuac field on the Texas coast have an unusual problem.

Despite heavy production, pressure in the field has gained 15 psi. since 1953, thanks to a water drive that is almost too strong. The water drive is forcing oil above the field's gas cap where it may never be recovered.

To counter this threat, operators have asked the Texas Railroad Commission to permit gas injection into the pool's gas cap. This would build and hold pressure in the cap and prevent it from shrinking more.

Sohio has an unusual combination water flood-gas injection project going in Eola field of Garvin County, Okla. Water-injection wells of 12,200 ft. are required plus use of 10,200-ft. wells on the high for gas injection. Payoff: A 72 per cent increase in ultimate recovery and reduction in producing life of field from 25 to 15 years (P. 124).

Few producers are aware that tubing constantly buckles in pumping wells. It's rare for preventive measures to be taken. Engineers now have the answers and methods to reduce the cost of this phenomenon (P. 139).

Some interesting facts are being turned up about perforating tools at Schlumberger's special lab at Houston. The lab tests simulate down-hole conditions. A startling fact shown: One tool with an inferior depth of penetration and hole size yielded a higher flow index. The secret of course is to avoid plugging (P. 94).

American REFINING is nearing a milestone. 10 million barrel daily capacity. The goal will be reached sometime next year.

The Journal's annual refining survey to be published next week will show projects planned or under construction will push capacity over the 10-million-barrel mark. But many of these expansion projects won't be completed until 1958. Others replace existing capacity. So the new milestone probably will be passed late in 1958.

Two trends also show up in the survey:

...Hydrogen treating expansion will have another big year.

...More alkylate to put higher octanes in motor fuel is forcing many refiners either to build or plan new alkylate capacity.

A different process scheme features Pontiac Eastern's Hattisburg, Miss., plant. The new 11,000-bbl. refinery will be on stream in July. Crude will be flashed and then charged direct to thermal cat-cracking unit and fluid coker. No crude distillation is included. Field distillate will be processed on a segregated basis. The result is expected to be high gasoline output from low gravity oil.

With so many refiners stepping up use of electrical motors, it may pay you to investigate nonexplosionproof motors next time. Esso Standard has done this at Baton Rouge and found they cost less without losing efficiency. Esso's motor program is outlined in detail on page 126.

Standard tries a flood of fire to make worn out oil fields produce again

Fire flooding produces heat and pressure to boil out previously unrecoverable crude oil, driving it underground to nearby producing wells.

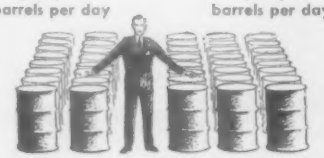
MANY INACTIVE WELLS STILL HAVE LOTS OF OIL left underground in spite of the industry's great advances in oil recovery. Our country must have this oil to meet the growing power needs of industry, the Armed Forces and motorists. That's why Standard is trying a new conservation experiment called "fire flooding."

We ignite some of the oil in a pool . . . control burning by regulating the air supply. Heat and pressure drive the oil to surrounding wells for pumping. It will take more than a year's time and a million dollars to see if fire flooding works. It's worth the effort because it could add more to U.S. underground oil reserves than the discovery of an entire new oil field.

Progress in the West means...

Helping find new sources of oil to supply the 13 million barrels per day the U.S. will need in 1966

1956	1966
8,827,000 barrels per day	13,000,000 barrels per day



Standard's petroleum engineers say, "Back in 1925 the industry could predict only about 20% recovery from a new field. Modern secondary recovery methods, of which fire flooding is one of the latest, could more than double recovery."

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Don't Miss the Special Section . . .

. . . Beginning opposite page 108. "Oil Hits Back" is designed to answer fully the widely publicized charges that the oil industry is gouging its customers, that it took advantage of an emergency to jack up prices, that it refused to do its part in helping meet the European oil crisis. The 16-page section has the facts you need to defend the industry against its critics.

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TECHNOLOGY–OPERATION

Refining-Processing

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First of a new Journal series on current operating problems in refining. This is a group of case histories on the fractionation system.

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A system of unit cost figures has been developed to aid in determining installed costs for instrumentation items.

How to Eliminate Need for Explosionproof Motors **128**
By Enoch Talley
This is done by designing units so that critical areas are eliminated. Here's how Esso does it at Baton Rouge.

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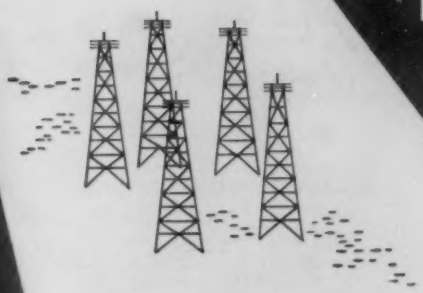

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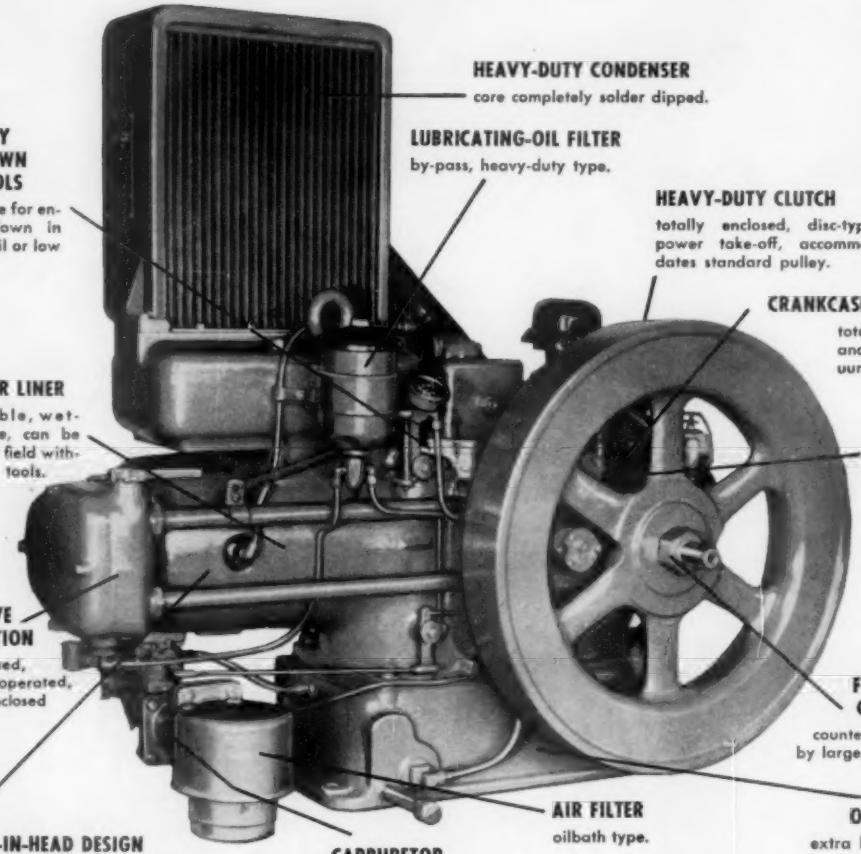

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G.T.M. ups life of salt water disposal lines from months to years

ANYONE connected with oil wells using salt water injection knows the serious corrosion of steel pipe caused by the brine plus traces of acid. At one large company, the life of such lines was limited to a few short months.

As an answer to the problem, the G.T.M.—Goodyear Technical Man—advised replacing the pipe in the pump assembly with oil-resistant Diversipipe (see blueprint). This rubber pipe would eliminate electrolysis—permitting use of cast iron fittings—and would compensate for contraction, expansion and vibration so that plastic or concrete pipe could be used on the remainder of the line.

The first Diversipipe was installed almost two years ago. Today, it looks good as new—promises years' more service—has been followed by several other installations. And there were major savings in its ease of installation and elimination of the need for concrete platforms.

Your corrosion or materials handling problems may be similarly solved by the G.T.M. who has well over 800 types of hose to handle anything pumpable. You can contact him through your Goodyear Distributor or Goodyear, Industrial Products Division, Akron 16, Ohio.

DIVERSIPIPE by

GOODYEAR

THE GREATEST NAME IN RUBBER

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

For specialized industrial purposes...

AiResearch butterfly valves

Valves can be designed and produced to your specifications in stainless steel, steel, aluminum, magnesium and various alloys in sizes from 1½" up to 16"

AiResearch butterfly valves handle air, gaseous nitrogen, gaseous helium, liquid oxygen, hydrogen peroxide and various types of fuels. Temperature capabilities range from −325°F to +1200°F.

Valves can be provided with either manual, pneumatic, electrical or hydraulic actuators and with controls for pressure, temperature and rate of flow. Basic characteristics are high flow capacity, tight sealing convoluted rims, ease of operation and maintenance, sensitivity over a wide throttling range and extreme dependability.

AiResearch has 15 years of experience in the design and manufacture of butterfly valves. You are invited to contact us for more specific information.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

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This seal on an air-compressor spells SAFETY from lubricant-caused fires and explosions

If you are operating one, ten or fifty air compressors in your plant, here's big news for you. The day of lubricant-caused compressor fires and explosions is *over!*

Now there's a new chemically tailored compressor lubricant called Pydraul AC that not only lubricates like a premium-grade petroleum oil—*it's fire-resistant!*

You'll realize additional savings in Pydraul AC's ability to minimize carbon deposits on air-compressor exhaust valves and air piping systems.

No conversion problems—just drain your flammable lubricant and replace with fire-resistant Pydraul AC—it's that easy.

Service-proved—two years of industry-wide service have confirmed Pydraul AC's *safety* and operating economies for power plants, gas transmission, chemical processing and the basic metalworking industry.

There's a fire-resistant Pydraul for every industrial hydraulic job: general-purpose Pydraul F-9; Pydraul 150 and Pydraul 60 for use in precision equipment; and Pydraul 600 for heavy equipment.

Pydraul: Reg. U. S. Pat. Off.

Write today for your copy of Pydraul AC bulletin.
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MONSANTO CHEMICAL COMPANY
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WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

THIS ENTIRE VESSEL was radiographed. Built for use by Socony Mobil Oil Company, Incorporated, it was stress relieved in thirds, and the two joints were stress relieved locally. The unit contains 30 uniflex trays of 96" diameter. Overall weight: 152,000 lbs.

Among the largest in use

...built by Newport News

This Debutanizer with a 110 feet 6 inches over-all length is typical of units that are readily built by Newport News . . .

In fact, Newport News can fabricate almost any type of pressure vessel or other heavy equipment used in the petroleum, chemical or other processing industries.

But at Newport News you'll find more than large productive capacity.

In vast fabricating shops, in huge machine shops, foundries and forging plants, Newport News craftsmen complete your order with specialized techniques. Plant methods . . . developed as a result of specializing for more than half a century . . . enable Newport News to provide money-saving answers to all sorts of heavy equipment problems.

Newport News craftsmen handle the job exactly as you want it done . . . for maximum results per dollar invested. So let us bid on your present or future projects. Learn how Newport News can help you. Send for our illustrated booklet entitled, "Facilities and Products"...it's yours for the asking.

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New RCA VHF Radiotelephone

...TURNS TALK INTO MORE EFFICIENT WORKBOAT OPERATIONS!

With RCA's new ET-8058 6-channel VHF Radiotelephone you get quick, dependable contact between shore-based offices and vessels, intership contact, safety and calling channels and public telephone correspondence service when used in conjunction with AR-8519 Auxiliary Receiver. You make as many calls as you want—no waiting for a line, no delays in giving or receiving information. Just pick up the phone and schedule, dispatch, report and institute last minute changes that cut hours off job-to-job sailing . . . improve overall operating efficiency . . . assure less waste, more profits!

If you operate workboats, fishing craft or small vessels in harbors, at sea or in inland waterways, you'll find this rugged RCA radiotelephone invaluable for 101 uses during the busy days ashore or afloat. Write for bulletin M-3005 giving complete product information and specifications.

Other RCA Marine Equipments for the Workboat Fleet

RADAR—RCA's CR-105B "workhorse" radar as an aid to safe navigation through foul weather and other traffic hazards. Ideal for vessels with space and power limitations. Indicator requires only two square feet of deck space, antenna is lightweight. Provides instant selection of 1-2-4-12-32-mile ranges on bright 10-inch scope.

DEPTH RECORDER—RCA Model LAZ-13A Recording Depth Sounder Echograph accurately records depths, warns of rocks, wrecks and other underwater hazards. A sensitive, accurate navigational instrument. Ideal for fishboats, workboats, all small craft!

LORAN—RCA LR-8803 Direct-Reading Loran is compact, economical, easy to operate! Make quicker, safer passages using Loran system of long-range radio navigation.

- **DEPENDABLE**
- **ECONOMICAL**
- **FLEXIBLE!**

- Covers any six channels within a 1.1 mc range in 148-174 mc band
- 30 watt output
- Remote frequency control
- Automatically reverts back to any predetermined channel after completion of call
- Operates on 115 V AC, 60 cycles
- Control unit provides for channel selection, power on-off, volume control, squelch, dimmer control
- FCC type accepted!

AUXILIARY RECEIVER—Model AR-8519 Auxiliary Receiver adds further versatility to the RCA VHF Radiotelephone system . . . provides facilities for transmitting on one frequency while receiving on another during the same transmission!

Write for free information today!

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RADIO CORPORATION of AMERICA

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NEW YORK 13, N.Y.

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So far as service is concerned, we are as close to you as our nearest distributor. It's an important advantage . . . another reason why GASO has become known not only as the tradename of the industry's best known portable pumps but as a *symbol of pumping service* that extends through all phases of selection, delivery and performance.

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When it comes to oil field metering . . . there's nothing better than

ROLOCHECK

equipment

ROLOCHECK Meters measure oil by alternately filling with and discharging exactly calibrated volumes of oil. Each cycle is counted on a new, rugged counter. ROLOCHECK Meters are designed for oil field use; **proven** in oil field service . . . no gadgets, no unnecessarily complicated controls to fail in unattended operations.

ROLOCHECK METERS. For use with existing separators or treaters. Available in various capacities and working pressures. **Write for Bulletin 56R.**

Features of ROLOCHECK Meters:

(1) **Extreme accuracy.** Upper and lower liquid levels are controlled in reduced-diameter necks.

(2) **No slippage.** The new Rolo Neutral-Position 3-Way Valve is of a special design which eliminates the possibility of both inlet and outlet ports being open at once when the valve is switching ports. **Oil cannot bypass the meter.**

(3) **Minimum maintenance.** Only internals are a float and a float guide rod. Valve has sturdy rubber-to-metal inner valves. Sand and other sediments are no problem.

Also:

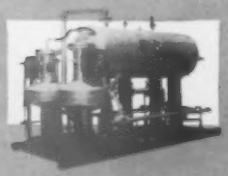
No minimum rate; will not pass free gas; new-design, rugged, foolproof counter. Equally efficient on oil or water measurement.

There's a ROLOCHECK Meter, in one of the forms shown on this page, for every application. Send in the coupon for complete information.

ROLOCHECK TWO-PHASE METERING SEPARATORS. Combine the ROLOCHECK Meter with an efficient separator, all in one vessel. Economical, space-saving. Write for Bulletin 56MS.

ROLOCHECK THREE-PHASE METERING SEPARATORS. Combine two ROLOCHECK Meters (one for oil and emulsion, one for free water) and a separator-free water knockout . . . all in one vessel. Write for Bulletin 56MS.

ROLO WELLCHECKERS. Completely piped separators with ROLOCHECK Meters and gas measurement facilities. Automatic free water knockouts, with ROLOCHECK Water Meters, optional. Available on skids or trailers. Write for Catalog 56W.



ROLO AUTOMATIC SAMPLER. The perfect sampling accessory to any ROLOCHECK Meter. For production containing free water, the addition of the Rolo Intermitter to the Rolo Sampler assures maximum sampling accuracy on even the highest water cuts. Write for Catalog 56W.

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Bulletin 56R ☐ Bulletin 56MS ☐ Catalog 56W ☐

NAME_____

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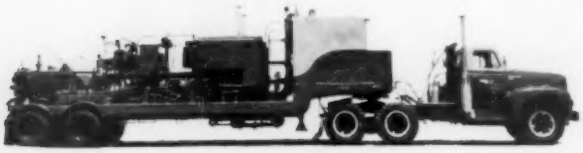
SAVE ON COMPLETION COSTS

WITH HALLIBURTON

MULTIPLE

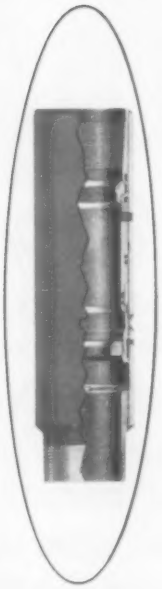
STAGE

CEMENTING

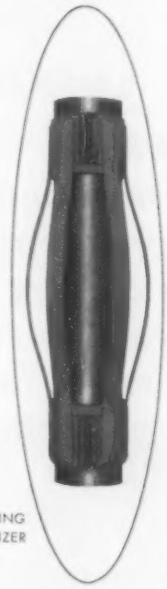


Completion costs can be cut on tough primary cementing jobs by multiple stage cementing the Halliburton way... with one casing string, with one time-saving trip to the well. You benefit in time and money saving from these important advantages:

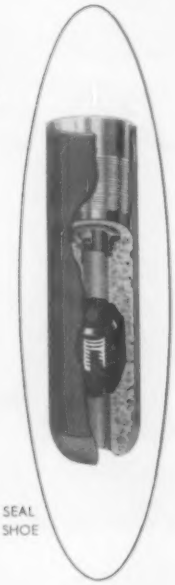
- Liner for production strings can often be eliminated.
- Full depth cementing in one operation.
- Widely separated formations can be cemented in one operation.
- Two or three different types of materials can be placed at predetermined points behind casing... in one operation.
- Better protection for dual zone completions.
- Pump pressures can be reduced, regardless of well depth.
- Less possibility of cement channeling.
- Reduces loss of cement slurry to weak formations.



"DV" MULTIPLE STAGE CEMENTER



"S-3" CASING CENTRALIZER



SUPER SEAL FLOAT SHOE

THE PERFECT COMBINATION FOR SUCCESSFUL TWO STAGE CEMENTING

Halliburton's "DV" Multiple Stage Cementers, Super Seal Float Collars and Shoes, and Casing Centralizers transform the conventional production casing string into an effective two stage cementing combination. The "DV" Cementer provides a positive fluid shut-off by means of hydraulically operated dual sleeves and high pressure packing. Special plugs and a baffle permit two and three stage cementing in a continuous operation or at desired intervals, using two or three different types of materials if required. "S-3" Casing Centralizers center the casing to permit more even distribution of cement, reduce channeling and provide for a better, more durable cement job. Super Seal Float Collars and Float Shoes save strain on rig and equipment by providing for "casing flotation" while running in ... and include a dependable Back Pressure Valve to keep cement below and behind casing.

This perfect combination for multiple stage cementing is another example of how Halliburton integrates tools, techniques and materials for your benefit.

Call the local or district office or write the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

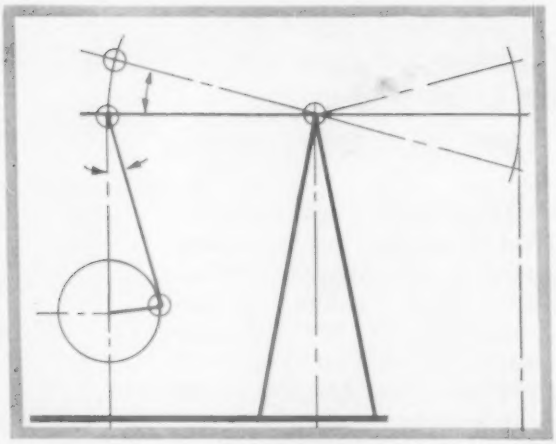
ASK FOR BULLETIN:
"HALLIBURTON'S DV MULTIPLE STAGE CEMENTER"

HALLIBURTON CEMENTING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

LUFKIN

THE UNIT WITH THE *highest* G* *factor*



LUFKIN'S *"UNIVERSAL CENTERLINE"* design and correct proportioning of beam working centers and samson post height to stroke length make for . . .

MAXIMUM MECHANICAL and GEOMETRICAL *Efficiency*

GOOD UNIT GEOMETRY IS *MOST IMPORTANT*

- A tall samson post and long working centers minimize pitman and beam angles, resulting in lighter bearing loads and lower friction losses, as well as increased mechanical advantage (lower torque factor) which decreases the torque load on the gears.
- Good unit geometry means smoother performance, lower operating costs, and longer life.

* Factor "G" or Geometrical Efficiency Factor = $\frac{\text{½ Polished Rod Stroke}}{\text{Max. Torque Factor}}$

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DU PONT *Petroleum Chemicals* NEWS

One of a Series of Bulletins for the Petroleum Industry

MARCH 1957

Locomotive maintenance men report longer bearing life with fewer greasings

After switching to a grease based on Du Pont Estersil GT (grease thickener), one company substantially reduced bearing maintenance and replacement costs.

Running almost continuously, the company's 22 locomotives many times a day haul heavy cars from mine to surface. They operate in tandem to pull 210-ton loads seven miles up a 3% grade.

Bearing maintenance reduced

Under such rugged service, the temperature of the four armature bearings in each locomotive rises as high as 300°F. Before an estersil-based grease was used, the bearings were greased every month. Now with estersil grease, the job is done only every *two* months.

The company's mechanics report important savings on bearing replacement as well. They point to the company's previous average of one bearing replacement every two weeks. Since estersil-based grease has been used (six months), not a single bearing replacement has been necessary.

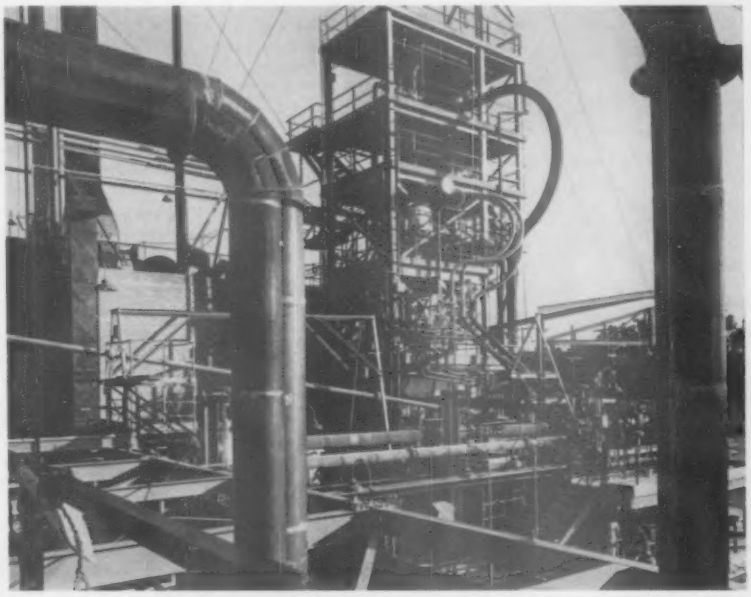
This compact locomotive operates under the toughest conditions. The grease packed into its armature bearings must have special properties to withstand the dust, high shear, and hot bearing temperatures.

The unique qualities of Du Pont Estersil GT are behind such dependable service. Estersil greases show outstanding resistance to mechanical breakdown and are practically immune to water, extreme heat and extreme cold.

A Du Pont Petroleum Chemicals Division representative will be glad to give you more detailed information about estersil GT and to provide samples. Contact any of our sales offices.

New Du Pont West Coast TEL plant now in production

The new tetraethyl lead plant constructed by Du Pont at Antioch, California, is now on stream. This will make possible extra-fast deliveries of California-made TEL to all West Coast refiners.



Top of TEL pipe alley looking toward reactor tower.

The new plant is located approximately two miles east of Antioch on the San Joaquin River.

Integrated facilities

The new plant was built to meet the needs of the fast-growing West Coast oil industry. The present Du Pont Petroleum Chemicals Division regional laboratory at El Monte, and sales offices in Los Angeles, San Francisco and Seattle, together with the new plant, will provide complete service for TEL-users on the West Coast.

Plant most modern in the world

The new Du Pont plant has the most modern TEL manufacturing facilities in the world, incorporating in its design and equipment the latest continuous processing advances and many other production refinements.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT *Petroleum Chemicals* NEWS

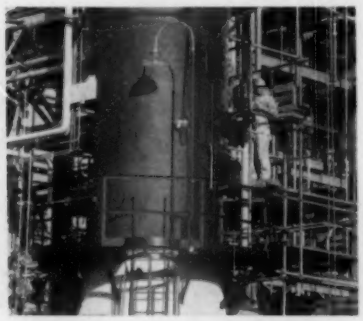
CONTINUED

New TEL Plant

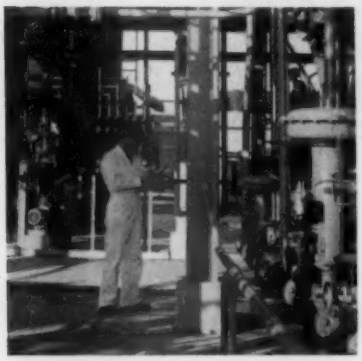
Another new Du Pont plant for making "Freon"* refrigerants and propellants is also located at Antioch. The "Freon" facilities were completed and production was started last fall.

Du Pont becomes a larger West Coast customer

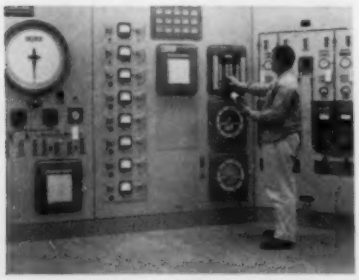
The two Du Pont plants at Antioch have become important new customers for large volumes of materials produced locally. Du Pont employees at Antioch already number 325; they were recruited locally.



Base of ethyl chloride column, TEL area.



Operator logging data in TEL area.



TEL central control room.

THESE MEN HEAD NEW ANTIOCH TEL PLANT

HENRY L. GREENE

DONALD C. MILLER

Top management posts at our new Antioch plant have been filled by Henry L. Greene and Donald C. Miller. Mr. Greene is plant manager and Mr. Miller assistant plant manager of the combined new TEL and "Freon"* refrigerant and propellant plants.

Mr. Greene joined the Du Pont Company in 1934 as a senior engineer. He advanced to supervisory posts at the Chambers Works, in New Jersey, then moved to Du Pont's neoprene plant at Louisville, where in 1946 he became assistant manager. In 1952 he was appointed assistant manager of the Savannah River Plant. He is a chemical engineer, a graduate of Kansas State College.

Mr. Miller came with Du Pont in 1937 as an analyst at Jackson Laboratory, Chambers Works. Following assignments in several other plants, he returned to the Chambers Works in 1943, where he became senior supervisor in TEL production. When in 1951 he was awarded the position of assistant works engineer, he was one of the youngest men ever to fill the job.

Mr. Miller received his B.S. in chemical engineering from Ohio State University.

**Registered Du Pont trademark.*

LITERATURE AVAILABLE

A handy check list for anyone planning dealer meeting programs.

Here is a partial listing of the many bulletins, reports, booklets, technical papers, and other aids available to you through any of the Du Pont Petroleum Chemicals Division offices:

Du Pont Estersil GT—A brief description of the properties, composition and applications of estersil grease thickener. Explains estersil grease preparation and contains handling information.

New Du Pont Dry-dye Eduction Probe and No-dust Drumhead—A folder describing and illustrating the revolutionary new dry-dye eduction devices, which make gasoline dyeing a cleaner, faster, and more efficient operation.

Sales Promotional Aids for Dealer Meetings—Describes the many Du Pont aids available for dealer meetings.

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. . . through Chemistry

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

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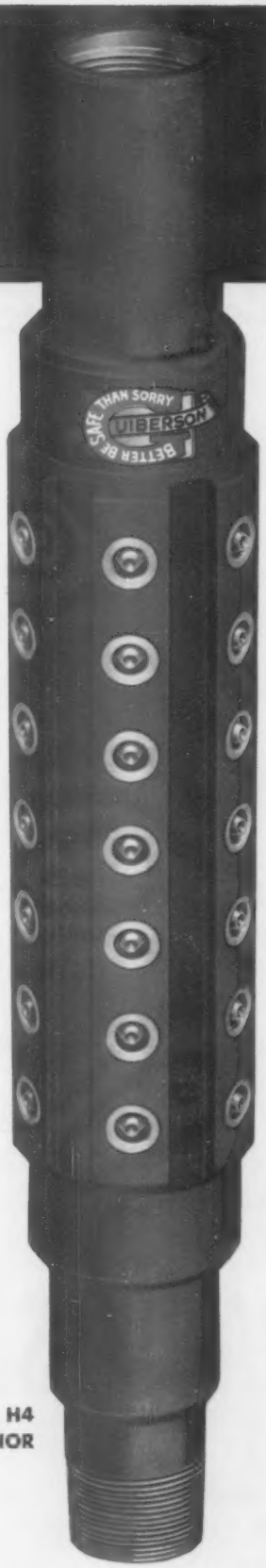
Printed in U. S. A.

GUIBERSON'S TYPE H4 *Hydraulic Anchor*



TYPE H4 ANCHOR

with MORE FLUID BYPASS

The channeled body H4 Anchor gives you four operational improvements — faster going in, better circulation in the hole, faster pulling out and simpler clean-up.

Completely automatic in operation, the H4 incorporates a body designed for unusually large bypass area and tremendous holding power. It has a husky fishing connection on top. Case hardened piston slips are retained by a stainless snap ring that holds the slips in retracted position while going in or pulling — keeps the slips from dragging on the casing wall.

We recommend the H4 for holding down production-type packers in acidizing, fracturing or other below packer pressuring operations. The H4 not only improves circulation, but speeds up operations and cuts down maintenance costs.

Guiberson H4 Anchors are individually tested and available in a full range of casing sizes.

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

No "Shade Tree" Jobs at

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One of the 13 modern Waukesha Sales & Service, Inc., Sales and Service Stores.

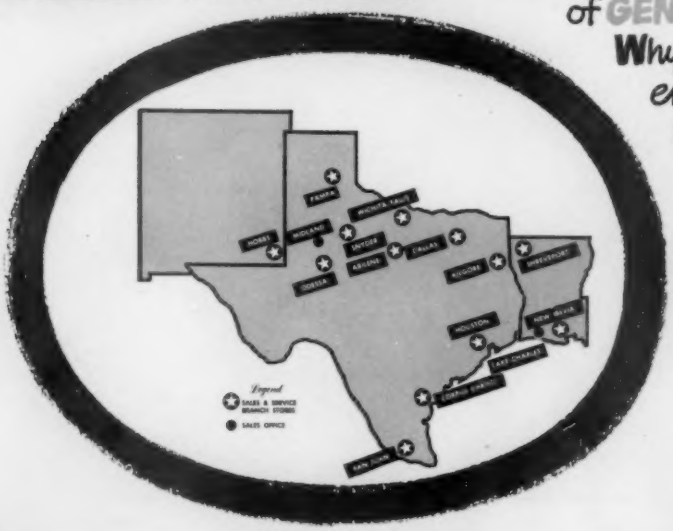
Complete repair facilities in a typical Sales and Service Shop.

Only at Waukesha Sales & Service, Inc., are you assured of getting genuine Waukesha parts.

Complete stocks of parts at all Sales and Service Stores.

At Waukesha Sales & Service, Inc. you get a professional repair job. Every one of Waukesha's thirteen branches gives you fast efficient service with modern equipment, factory trained mechanics and complete stocks of GENUINE Waukesha parts.

Why take a chance? Send your engine home to Waukesha Sales & Service, Inc. and get the job done right.



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Sales & Service, Inc.

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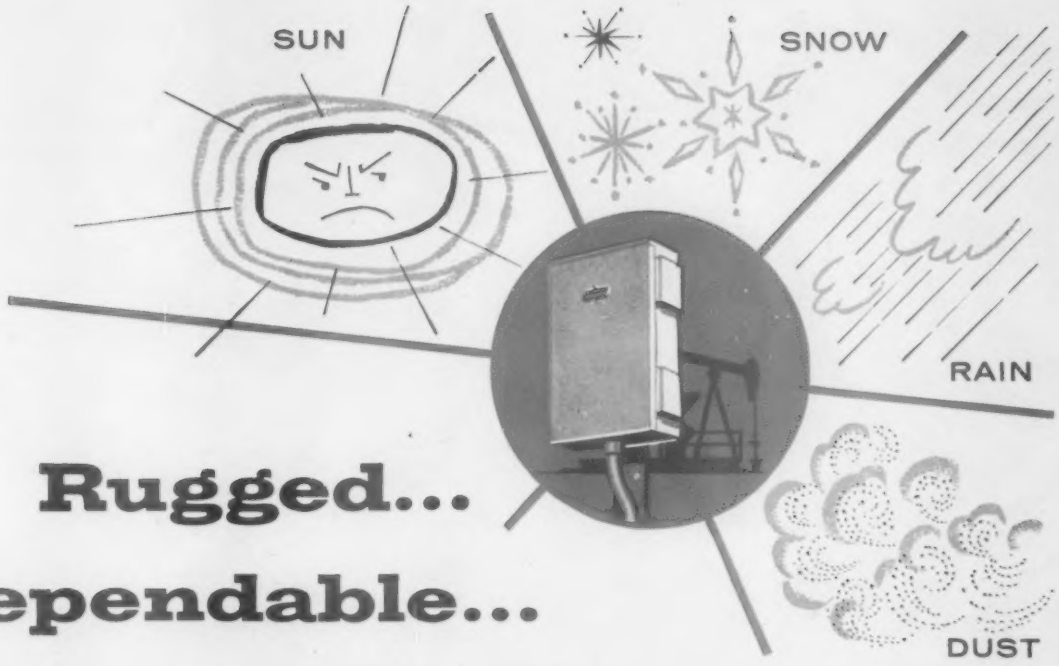
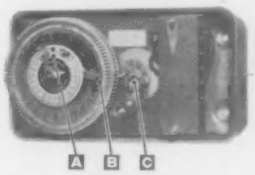


Rugged... Dependable... Completely Automatic...

CUTLER-HAMMER THREE-STAR OIL WELL PUMPING CONTROL is the overwhelming choice of oil field engineers everywhere. No other control is as rugged . . . Cutler-Hammer control is immune to blistering heat, to choking dust, to driving rain, sleet and snow. No other control is as dependable . . . Cutler-Hammer control, featuring vertical dust-safe contacts, can be relied upon to pump your wells *indefinitely* without attention as far as the electrical equipment is concerned. No other control is as completely automatic . . . the Cutler-Hammer Supertimer has made oil well pumping by *automation* a reality.

For your next pumping well, insist on Cutler-Hammer Three-Star Oil Well Pumping Control. No other control offers as many outstanding features: exclusive Cutler-Hammer Supertimer—Three-Star magnetic contactor with vertical dust-safe contacts—aluminized, chimney draft-design enclosure—vertical contact contactor type disconnect switch—advanced-design lightning arresters—full three-phase, three coil overload relay—selector switch for automatic or manual operation—dead phase protection—double door isolation of live parts—undervoltage release relay—spring-clip type fuse receiver—removable steel component base plate—padlock features for outer door, inner door, and Supertimer.

Your nearby Authorized Cutler-Hammer Distributor is stocked and ready to serve your needs. Order from him today. CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.



NEW CUTLER-HAMMER Supertimer

This is automation in action. You pre-set the Supertimer to meet your field allowable and the control will do the rest, automatically. It starts, stops, restarts and cycles indefinitely, precisely according to your schedule. If a power outage occurs, any number of C-H controlled pumps are automatically restarted in an exact sequence to avoid overloading the power lines on inrush. Unfortunate coincidental starting of even two pumps is impossible.

- **A** Sets the precise restarting time delay from zero to 180 seconds. This is exclusive with the Supertimer—unfortunate coincidental starts of even two pumps are impossible.
- **B** Sets the daily pumping schedule—pull a tab for each fifteen minutes of pumping, space them through the daily 24 hour period as desired.
- **C** Sets the weekly pumping schedule—1, 2, 3, 4, 5, 6 or 7 days per week as desired.

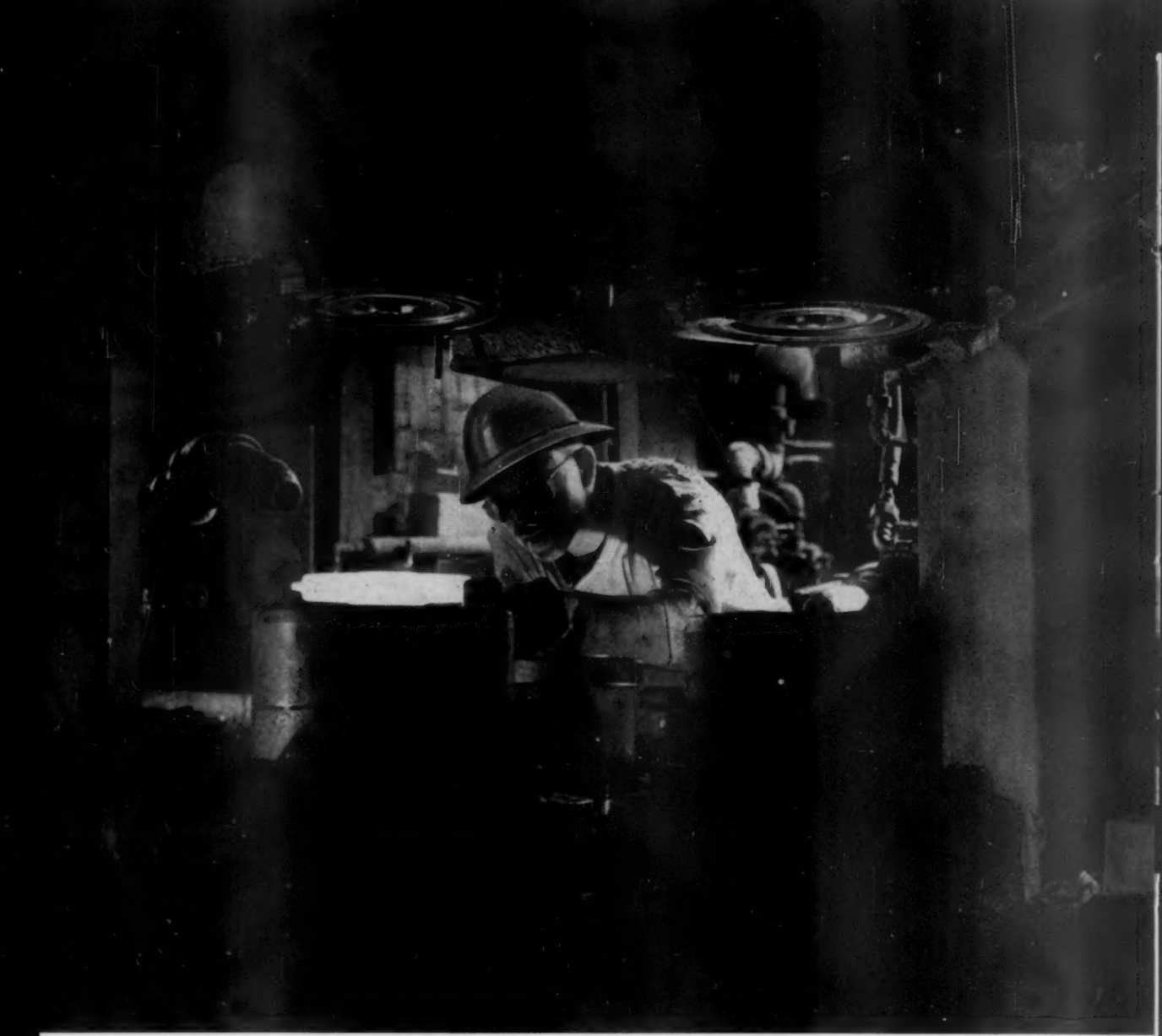
CUTLER-HAMMER
MOTOR CONTROL
C-H

Member American Petroleum Institute

COMPLETE PROTECTION. The control is protected against lightning with exclusive, advanced-designed lightning arresters; and the three coil overload relay protects the pump motor from overloading and dangerous single phasing which often results from lightning.

CHIMNEY DRAFT VENTILATION. The heat-reflecting, aluminized enclosure insures a constant circulation of air . . . no nuisance tripping because of trapped heat.

DUST-SAFE CONTACTS. Dust-Safe vertical contacts stay clean and eliminate the necessity of contact replacement.



Sharp eyes follow your Bethlehem drop forging

No need to point out that the making of a good drop forging requires sharp eyes. But at Bethlehem, we like to feel that the eyes are a little sharper than usual. That's just a way of saying every operation is watched with particular care.

It's the type of care that begins at the furnaces, where the steel is made, and is evident in all the successive steps of rolling, forging, heat-treating, cleaning, and inspection. And throughout the entire process our metallurgical watchdogs are always on the job, continually checking such matters as analysis, hardness, etc.

Bethlehem offers a thoroughly integrated set-up, one that produces a huge variety of drop-forge designs. Every aspect of the service is strictly first-class. If care and alertness are extras that you value, it will be to your advantage to call us.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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BETHLEHEM STEEL

BETHLEHEM STEEL

Rust-Oleum is distinctive as your own fingerprint. Accept no substitute.

. . . goes on faster, stops rust, lasts longer over rust!

ONE MAN often does the work of two!

EASIER TO USE—because Rust-Oleum 769 Damp-Proof Red Primer goes over rusted metal after scraping and wirebrushing to remove rust scale and loose rust—usually eliminating costly surface preparations. *Stops Rust*—because Rust-Oleum's specially-processed fish oil vehicle *penetrates* rust to bare metal—driving out air and moisture that cause rust.

LASTS LONGER applied over rust—and teamed up with Rust-Oleum's many attractive finish coatings, assures lasting beauty. Try Rust-Oleum on *your* tanks, metal sash, machinery, wire fences, stacks, girders—or around *your* home. Prompt delivery from Industrial Distributor stocks. Write for illustrated literature with color charts showing colors and applications.

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RUST-OLEUM®

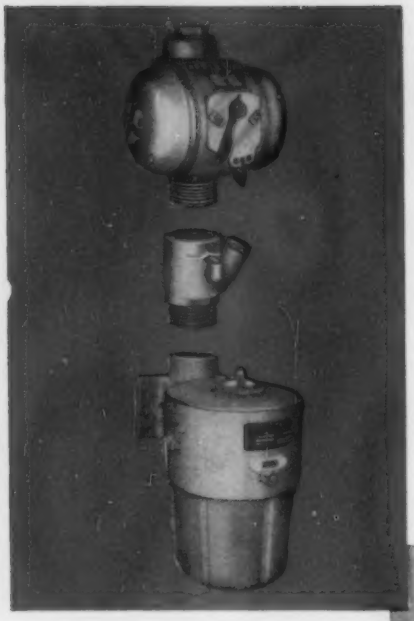
30% GREATER COVERAGE—MANY ATTRACTIVE COLORS

Rust-Oleum covers up to 30% more area, depending upon surface condition and porosity. And you can beautify as you protect with Rust-Oleum finish coatings in Aluminum, White, Red, Gray, Green, Blue, Yellow, Black, etc.

STOPS RUST!®

Rust-Oleum and Stops Rust are brand names and registered trademarks of the Rust-Oleum Corporation.

Write for special report showing Rust-Oleum penetration to bare metal.



For complete protection . . . against explosion, dust, rain . . . use

APPLETON

INDUSTRY'S MOST ADVANCED LINE

Circuit Breaker, Motor Starter and Combination Motor Starter

UNILETS®

More TOP-QUALITY features!

- First to be U.L. Approved for banked circuit breaker grouping
- Combinations meet U.L. requirements through approval of components
- No shut-downs while entering motor starter of a combination
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- Compact, lightweight construction
- Units may be added quickly, easily
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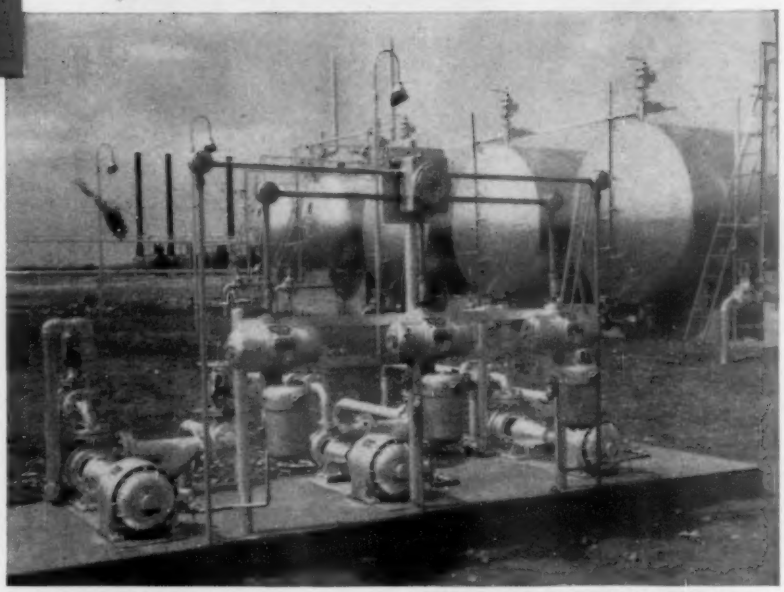

Photo courtesy Oil & Gas Journal

APPLETON Circuit Breaker and Motor Starter Unilets on tank car loading pump motors in field processing plant.

Also Manufacturers of:

The biggest advancement in Explosion-Proof design in years! The design, construction and performance of APPLETON *Circuit Breaker and Motor Starter Unilets* give you maximum safety and unparalleled ease of wiring, installation and maintenance. You'll discover initial and long term savings plus many exclusive APPLETON features, not found in any other enclosure. Where absolute safety is required, regardless of the installation, APPLETON can serve you better! Send for Bulletin BH today for complete information!

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APPLETON ELECTRIC COMPANY
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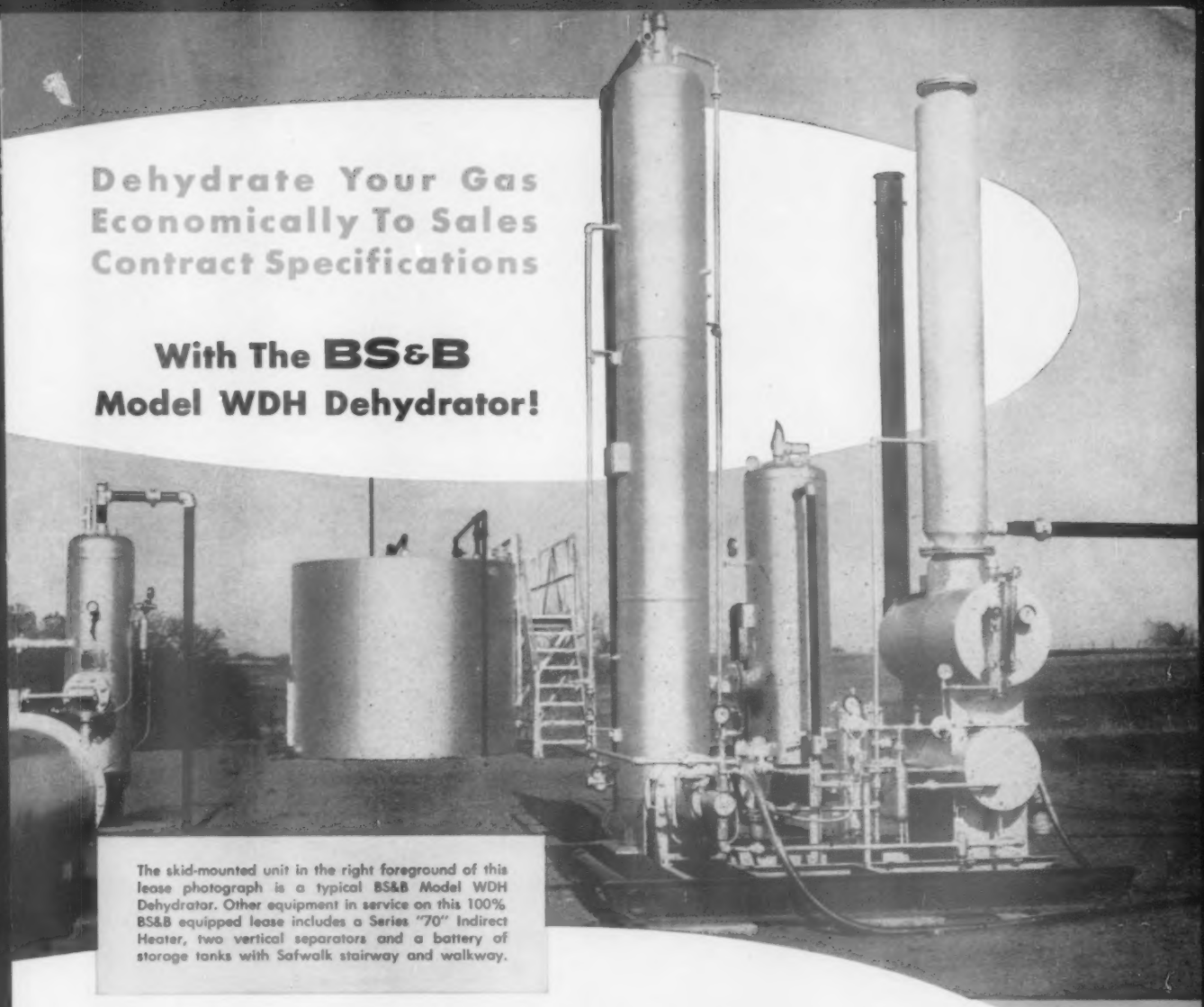
Rely on* APPLETON . . . *the Standard for Better Wiring

Dehydrate Your Gas Economically To Sales Contract Specifications

With The BS&B Model WDH Dehydrator!



The skid-mounted unit in the right foreground of this lease photograph is a typical BS&B Model WDH Dehydrator. Other equipment in service on this 100% BS&B equipped lease includes a Series "70" Indirect Heater, two vertical separators and a battery of storage tanks with Safwalk stairway and walkway.

Costs Less To Buy... Costs Less To Operate!

The BS&B Model WDH Dehydrator is the *original* lease size glycol type gas dehydrator designed to produce a 65°F. minimum water dewpoint depression at low operating cost. Units designed to produce water dewpoint depressions of 75°F. minimum or 90°F. minimum can be furnished for special problems.

Under normal operating conditions, glycol consumption of these units will not exceed one-tenth gallon per 1 MMSCF of gas processed. Initial investment in the unit itself is only about one-half that required for most other types of automatic gas dehydrators.

Standard units are available in nominal gas capacities ranging from 1 to 60 MMSCFD, but special sizes have been built with gas capacities of up to 500 MMSCFD. All units are skid-mounted (to the extent that shipping limitations will allow) and can be quickly and easily hooked up in the field.

For extremely cold climates, BS&B offers a complete line of Model WDH Dehydrators especially designed for cold weather operation without expensive housing. Ask your BS&B Man for details—or write to . . .

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A3A

P. O. Box 1714 Oklahoma City, Oklahoma

ENGINEERED FOR ACCURACY

WESTERN'S Electronic Pressure Recorder

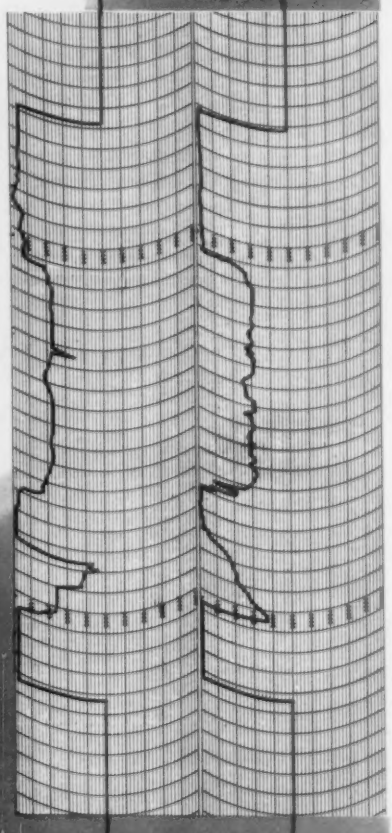
Another example in the pattern of Western engineering for superior well services—the Electronic Pressure Recorder allows more complete, accurate fracturing and acidizing treatment control.

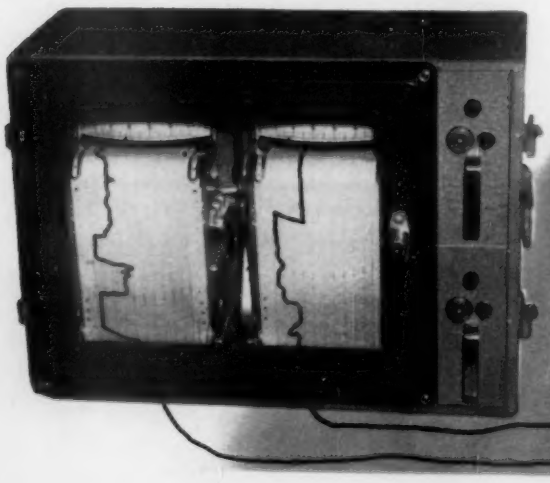
The ultra-sensitive electronic circuit provides accuracy and safety in pressure recording unattainable with conventional systems. The Electronic Recorder operates up to 200 feet away from the well head and eliminates hazardous high-pressure rubber lines that are susceptible to material faults, ruptures, line obstructions and freeze ups.

A permanent visual record of pressure-versus-time is afforded by the continuous strip-type pressure log throughout the treatment, regardless of length.

Get all the advantages of Western Engineering in fracturing, acidizing, radioactivity logging and jet perforating. Contact your nearest Western office, and next time—GO WESTERN for—

"engineered well services"





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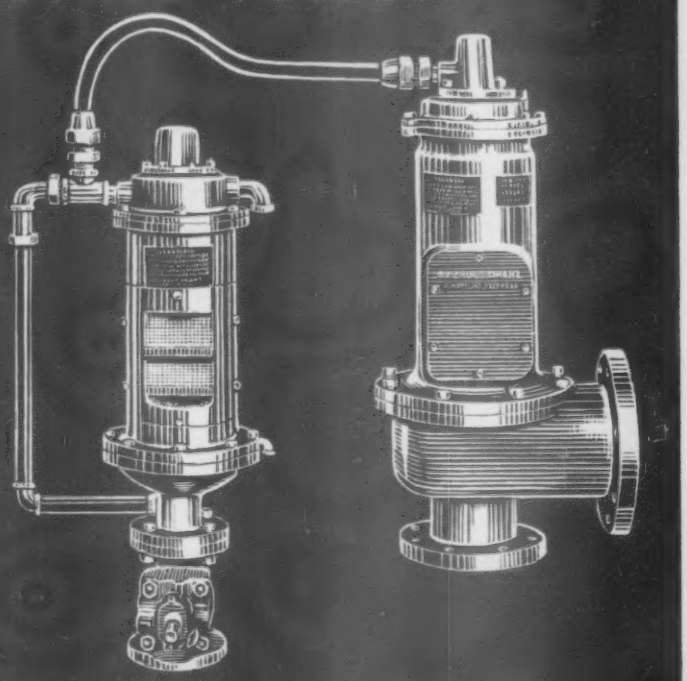
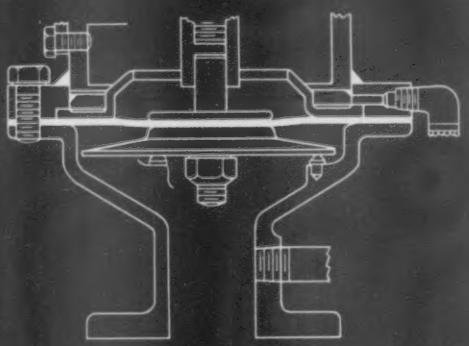
★ maximum safety
for pressure vessels



Protecting pressure storage vessels against the hazards incident to tank rupture due to excessive internal pressures is the purpose of S. & J. Pilot Operated Relief Valves, which are made in two models. The Model ST-5000 is applicable to vessels operating at pressures ranging from 1 to 15 pounds; and Model ST-2500 applicable to vessels with pressure ranges exceeding 15 pounds.

These pressure relief valves have Safety Features not found in other types of venting equipment—they are FRICTIONLESS in operation, with no bearings or sliding guides. No lubrication is required. They have considerable reserve force, and they operate at the exact pressures at which set, giving high venting capacity for their sizes.

The most important consideration is a patented safety feature* built into the pilot valve. Since there is always a remote possibility that the diaphragm in such a valve may rupture from fatigue, the piston of the pilot valve is so proportioned that tank pressure operating against it will cause the valve to open at a pressure below the regular setting.



* PATENTED SAFETY FEATURE
The effective area of the piston being greater than that of the diaphragm would cause the valve to vent at less than the "set" pressure, even if the diaphragm were entirely removed.

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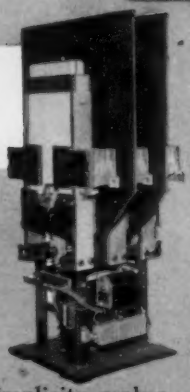
CHOICE of CONTACTORS

to meet your specific needs

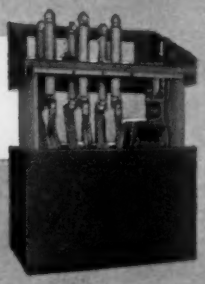
ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

Allis-Chalmers Type H Starters may be equipped with either air-break or oil-immersed contactors —installed in the same sized space.



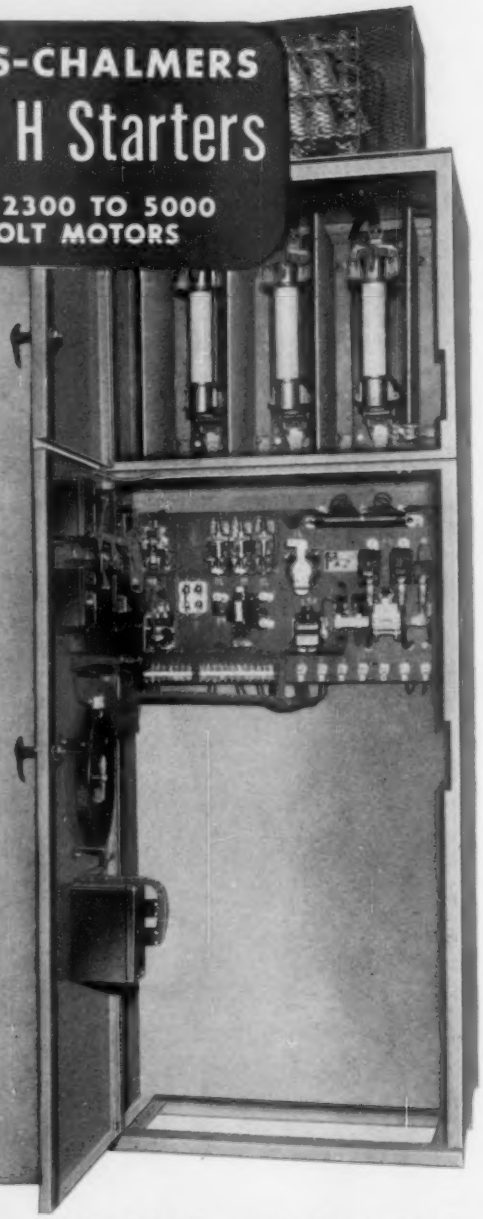
AIR

Designed for top performance on the rough-tough jobs. Advantage of contacts operating in air include long contact life, reduced fire hazard, easy maintenance. Double-break contacts, vertical action and dual blowouts provide long, dependable operation. Design simplicity makes contactor particularly adaptable for applications requiring frequent starting, inching, reversing, or dynamic braking.



OIL

Meets operating demands of semi-hazardous locations. Contactor operates under oil to prevent sparks from igniting atmosphere and to protect mechanism from corrosion. Contactor is time-proved clapper type. Self-cleaning, rolling-wiping action extends contact life. Self-aligning E-type magnet provides perfect armature seating . . . quiet, maintenance-free operation.



YOU GET MORE...

Allis-Chalmers offers help on specific control application problems. Call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by the experience gained in solving thousands of control problems . . . by complete research and testing facilities.

For complete information on the Type H starter, write for Bulletin 14B6410B — Allis-Chalmers, General Products Div., Milwaukee 1, Wis.

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THE TOOL

THAT GETS THE JOB DONE !

EASTCO

2 CUTTER HOLE OPENER

It's designed expressly for DIRECTIONAL DRILLING OPERATIONS

- Here is the best tool to use for reaming whipstock or knuckle joint pilot holes to full gauge. It is also used in opening core holes.
- This tool is sturdily built, and the body and solid ball guide is a single rugged steel casting. The roller bearing cutter assemblies are easily and quickly changed. No welding is necessary.
- The ball guide centers the tool which prevents sidetracking the hole. Jet action circulation directed ahead of both cutters insures fast efficient operation.
- The EASTCO 2 cutter hole opener is available in popular size ranges from 6" through 12¼".
- It is standard equipment throughout the world with hundreds of efficiency-wise operators . . . MAKE IT YOURS!

DIRECTIONAL DRILLING Eastman OIL WELL SURVEYS

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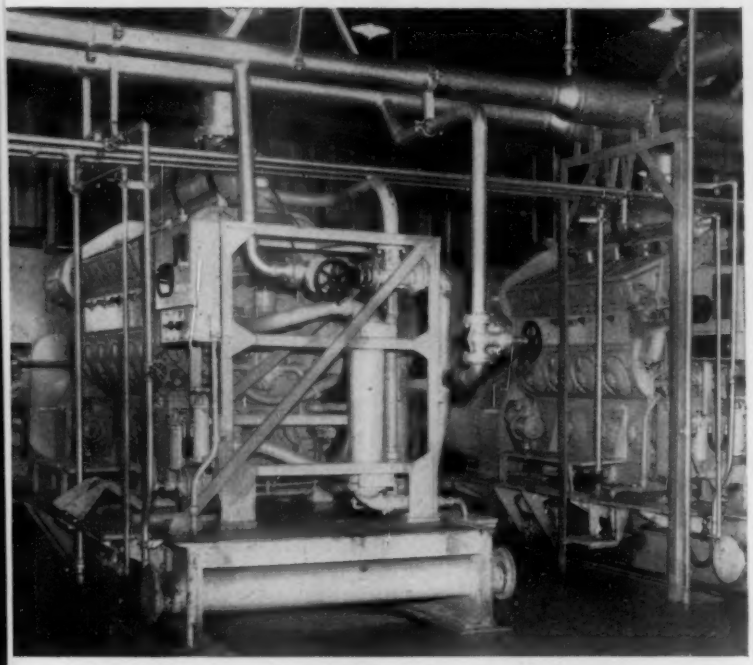
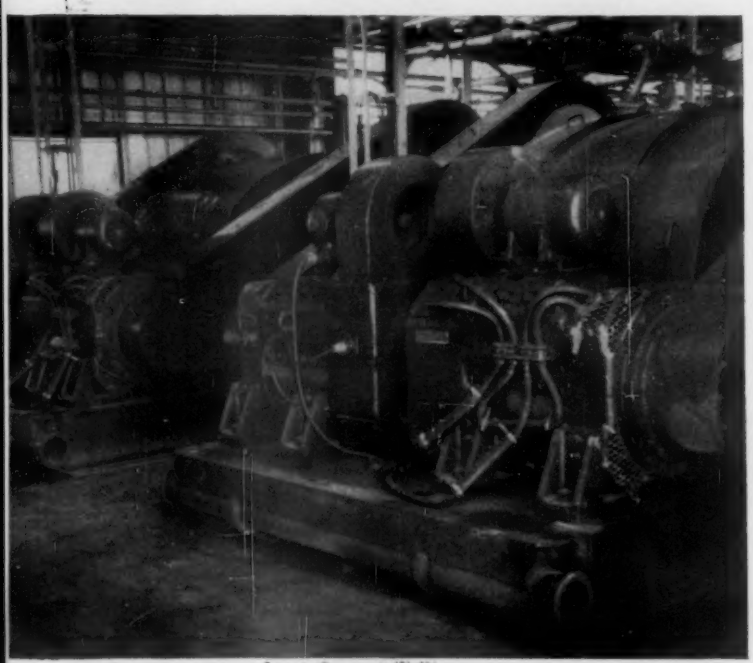
FIRST A TENDER — AND



Opposite the drilling platform on Rig 46 are three Electro-Motive 900-hp generating sets. Each of these 8-cylinder engines drives two 500-kw generators and comes complete on skids with air or water cooling, engine and generator controls. Kermac III, though radically different in design, uses the same standard Electro-Motive Power system.



Typical arrangement of Electro-Motive 625-hp dc drive motors with mud pumps is shown on Rig 46. Similar motors on the draw works are equipped with the new Super-Excitation control which provides a braking action when power is removed. In effect, the motor becomes a generator which slows smoothly and quickly yet retains all acceleration, torque characteristics and other power advantages of the series motor.

Towering mast on Rig 46 dwarfs men beside centrally-located driller's control that operates all Diesel-electric equipment. Called the tallest floating structure in the world, Rig 46 measures a whopping 268 feet from base to mast top. Sliding cantilevered drilling platform can drill six wells from one rig location. Overall area covered by the rig measures 242 by 202 feet.

NOW THE GIANTS

Pioneer Kermac fits new rigs 46 and 47 with ELECTRO-MOTIVE POWER

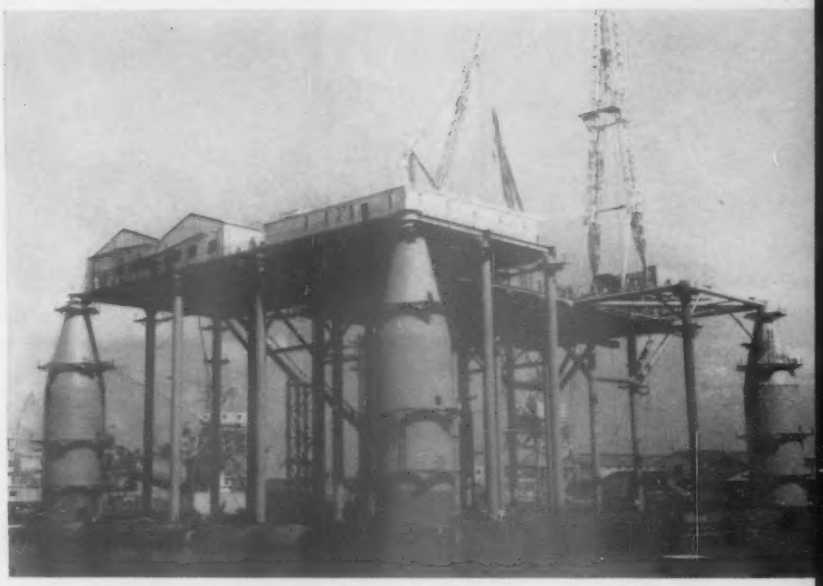
Kerr-McGee Oil Industries, Inc., was the first to operate a tender-platform with a complete Diesel-electric power system. The tender, Kermac III, working with Rig 48 in the West Delta Area has demonstrated its ability to make hole fast —recently drilled to 14,088 feet in 67 days.

Kermac III is powered by two Electro-Motive 900-hp generating units that team with a third on Rig 48 to power electric drive motors on draw works, rotary and mud pumps.

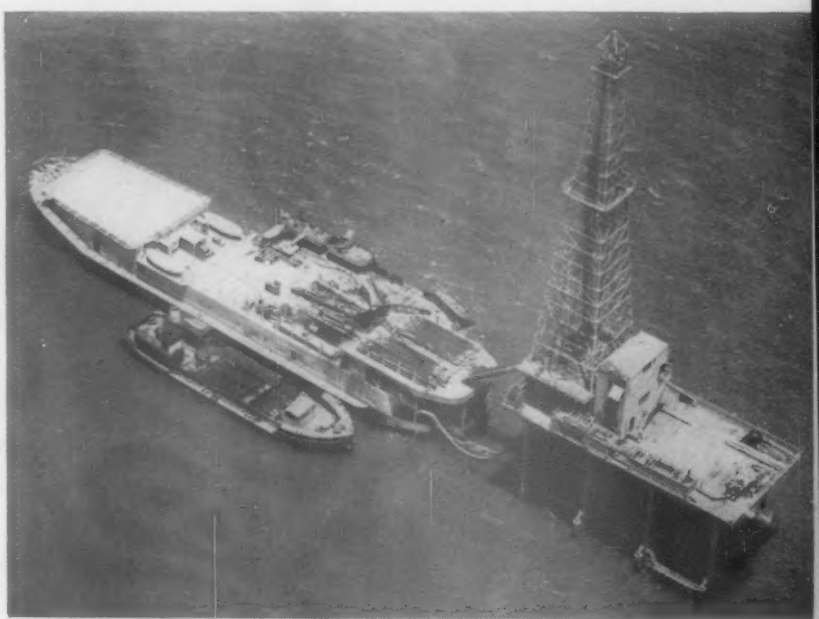
Kermac's new giants—Rigs 46 and 47—are of radically new design, yet their power is the same as that for Kermac III and Rig 48. The reason? Flexible electric cables between generating units and drive motors permit complete freedom of power arrangement. Thus, rigs can be designed to requirements without restrictions due to alignment.

Power to make hole fast; flexible to meet varying drilling conditions; simple, accurate controls; matched components, designed and built by one manufacturer—these are reasons why more offshore rigs use Electro-Motive Power than any other Diesel-electric drilling system.

Both land and offshore rigs are successfully reducing drilling time and costs with Electro-Motive Power. See or call your Electro-Motive representative for complete information.



Kermac Rig 46 is a new type of giant mobile barge capable of drilling in 70 feet of water. Rig 47, recently launched, is of identical design.



Kermac Tender III and Rig 48—first tender platform to have a complete Diesel-electric power system.

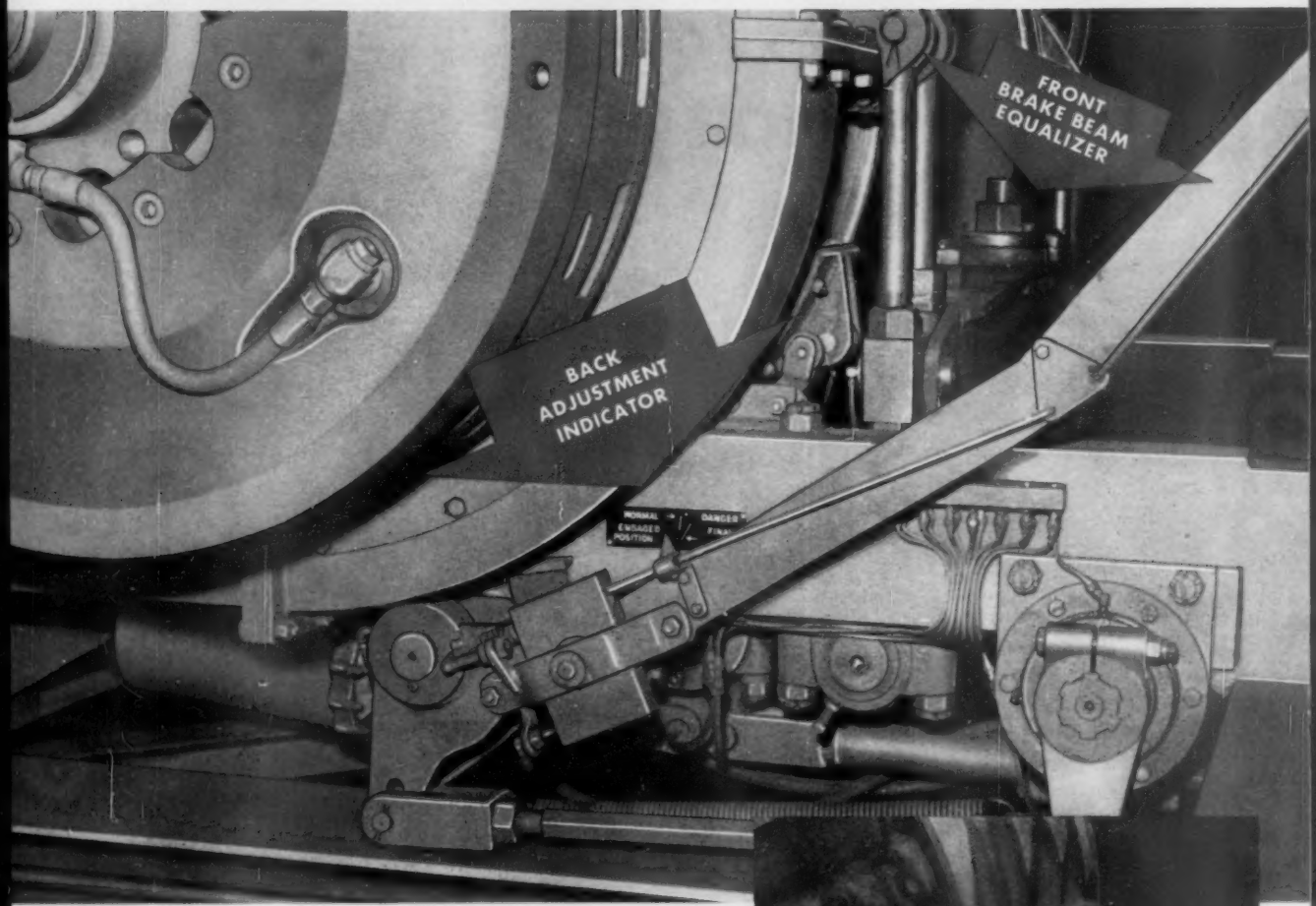
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
LA GRANGE, ILLINOIS

In Canada: General Motors Diesel Limited, London, Ontario

Petroleum industry sales offices: Tulsa, Oklahoma; Houston, Texas; Dallas, Texas; Morgan City, Louisiana; Pasadena, California.

Spectacular...New...

ONLY on WILSON SUPER RIGS

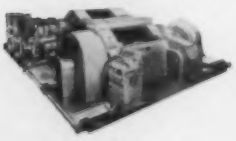


NEWEST OF NEW . . . EXCLUSIVE Wilson features . . . the special BRAKE ADJUSTMENT INDICATOR, FRONT BRAKE BEAM EQUALIZER and Wilson Air Power Cylinder. Combined they give the driller the GREATEST BRAKING SYSTEM ever developed for drilling rigs. Not outmoded brakes made over . . . but absolutely the newest, most advanced, pace-setting braking system . . . anywhere! To the driller this means the SMOOTHEST, EASIEST, SAFEST HANDLING (they will not kick) brakes he can touch. So, consider ONLY the BEST . . . WILSON RIGS . . . they're the WORLD'S BEST! Write for Catalog 257.

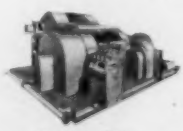
FLAME HARDENED BRAKE RINGS

BE MODERN — BUY WILSON

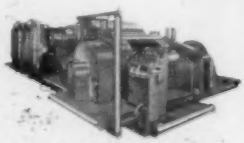
WILSON
MANUFACTURING CO., INC.
WICHITA FALLS, TEXAS, U. S. A.
The Home of RED IRON



Super Titan "66"
22,000 Ft.—4½" Drill Pipe
25,000 Ft.—3½" Drill Pipe

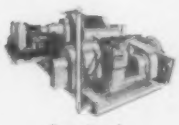


Super Titan "56"
15,000 Ft.—4½" Drill Pipe
19,000 Ft.—3½" Drill Pipe



Super Atlas
11,000 Ft.—4½" Drill Pipe
13,000 Ft.—3½" Drill Pipe

Super Giant
9,000 Ft.—4½" Drill Pipe
11,000 Ft.—3½" Drill Pipe



Super Mogul
7,500 Ft.—4½" Drill Pipe
8,500 Ft.—3½" Drill Pipe

A WHOLE NEW LINE OF RIGS

Have we checked Columbia-Southern lately? T. J.

First producer to improve shipments by promoting customer aids like the fusion welded tank car and the 55-ton single unit car.
Say, that's right!– DHT, Purchasing

First producer to reduce customer freight costs by opening facilities on the Ohio, pioneering the development of America's "Chemical River."
Everybody sure followed them!
CBW Traffic

First producer to cut customer costs by launching a fleet of high capacity barges for inland water deliveries.
I remember that! RPM, Finance

Still one of the nation's leading merchant producers of chlorine, with all the dependability of supply, control of quality, and depth of customer servicing this leadership implies.
No question about it!
JTH, Technical Staff

First producer to standardize on the tank car dome platform for added safety in customer unloading.
Meant a lot to us then– and now!
ANH, Plant Safety

So often, it costs less to deal with the leader.
Let's check Columbia-Southern today! DHT
RPM, ANH, CBW, JTH

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston
New York • St. Louis • Minneapolis • New Orleans • Dallas • Houston
Pittsburgh • Philadelphia • San Francisco
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

GET THE BEST SOLUTION TO EVERY FLOW

. . . with Foxboro Instrumentation

Differential Pressure Cell Transmitters

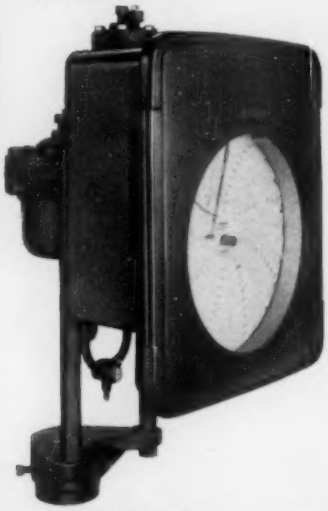
Complete line includes air-operated and electric-operated d/p Cell Transmitters covering ranges from 0-20" to 0-800" of water; working pressures up to 1500 psi.

Type 13A d/p Cell Transmitter

- Positive Overrange Protection—up to full 1500 lb. rating
- Fully Adjustable Ranges—0-20" to 0-80" and 0-50" to 0-250" water
- Automatic Internal Damping — fast, stable measurement
- Simplicity—easiest, lowest-cost installation, lowest maintenance

Mercury Type Meters

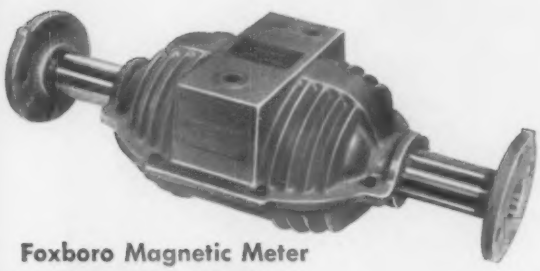
Complete line includes mercury types covering ranges from 2 to 400" of water; working pressures up to 5000 psi.



Type 28 Mercury Meter

- Permanent Full-Scale Meter Accuracy — exclusive segmental lever design provides linear transmission from float to pen
- Highest-Powered Pen Drive — large float with long travel
- Minimum Ambient Temperature Effects — float located in high pressure chamber

PROBLEM



Foxboro Magnetic Meter

- Measures Fluid Velocity Directly
- Adds No Pressure Drop
- Uniform Flow Scale
- Overall Accuracy Better than 1% of Range Over Entire Scale
- Full Accuracy Sustained Even on Liquids Other Meters Can't Handle — even sand and water slurries

THERE ARE two logical reasons why Foxboro Instrumentation assures you *optimum* results in measurement or control of process fluid streams. First; Foxboro offers the widest variety of measuring and controlling devices . . . the *right* equipment for every application. For example, only Foxboro offers all these basic meter types: differential pressure cell flow transmitters, magnetic meters, mercury meters, and weir meters. Second; Foxboro provides 45 years of engineering experience in every phase of fluid mechanics. From the simplest general utility-type instrument to complex automatic ratio control systems, you get highest accuracy, efficiency, and economy. Whenever you have a flow problem involving liquids, vapors, gases, or slurries — in pipes, ducts, or channels, you can solve it best by specifying Foxboro. Only a few instruments are described on these pages. For full details; or for specific information on *your* problem, contact your nearby Foxboro Field Engineer, or write The Foxboro Company, 603 Neponset Ave., Foxboro, Mass.

FOXBORO

REG. U. S. PAT. OFF.

FIRST IN FLOW

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

Float-and-Cable Type Meters

- Rigid Construction — weather-tight case; all working parts of corrosion-resistant materials
- Powerful Accurate Operation — large, high-stability float; cable of Type 302 Stainless Steel—non-stretching, non-twisting
- Direct Reading Chart and Scale
- Direct Reading Integral Counter

Other Foxboro Flow Instrumentation

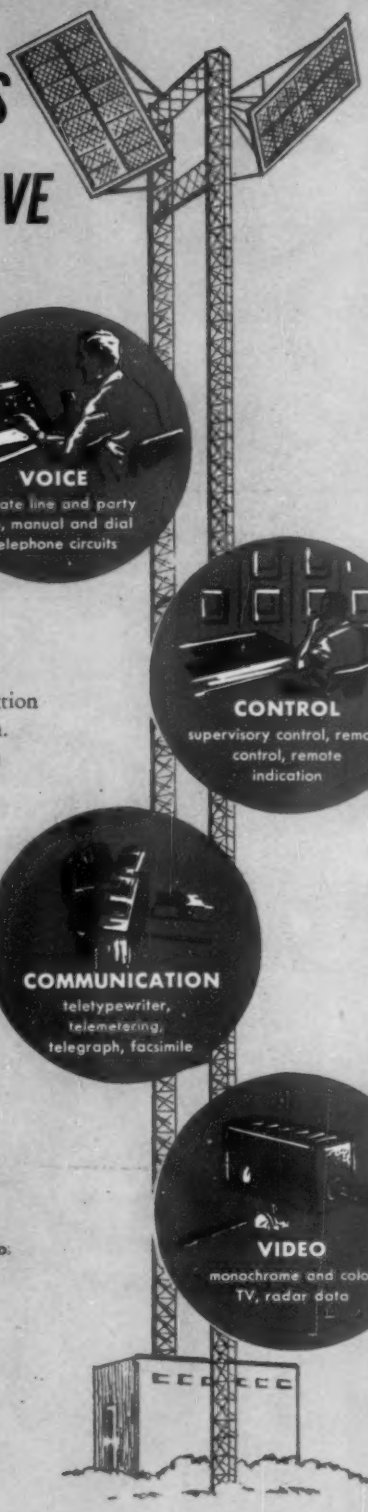
Electric or Pneumatic Type Rotameters

Electric, Pneumatic, and Mechanical Integrators

Planimeters

All Primary Elements, Valves, and Accessories required for assembly of complete flow measurement and control systems

DO A BETTER COMMUNICATIONS JOB WITH MOTOROLA MICROWAVE



Motorola multi-channel microwave facilities can transmit:
VOICE • CONTROL • COMMUNICATIONS • VIDEO

ECONOMICAL The most economical type of multi-channel communication.

EASY TO EXPAND Channels can be inexpensively added.

WEATHERPROOF Maximum protection from failure due to snow, ice, rain, lightning, and high winds.

VERSATILE Spans rivers, swamps, mountains, and busy city streets with ease and is virtually unlimited in length.

PRIVATE Owner has complete control of communications facilities at all times; narrow beam assures private communication.

Modern industry is increasing the emphasis on automation, data transmission, and centralized control in order to provide better protection of personnel and property, better service, and more efficient operation. Motorola microwave can provide the *complete* communications system needed for this type of operation.

More miles of MICROWAVE—IN and OPERATING

Working dependably over the years, Motorola microwave systems ranging from 7 to over 1000 miles in length are operating in all types of applications and in all kinds of weather. This greater acceptance and experience means engineering and production "know how"—equipment which performs better, lasts longer, and costs less to maintain. These extra dividends repeatedly appear in operational records of Motorola users.

PARTIAL LIST OF PETROLEUM-GAS INSTALLATIONS

Interstate Petroleum Communications, Inc.
Kentucky and West Virginia Gas Co.
Mid Valley Pipeline Co.
Natural Gas Pipeline Co. of America
Natural Gas Storage Co. of Illinois
Clinchfield Coal Corporation*
New York Natural Gas Pipeline
Ohio Oil Co.
Pan American Pipe Line Co.
Panhandle Eastern Pipe Line Co.
Sinclair Pipe Line Co.
Texas Gas Transmission Co.
Texas Illinois Natural Gas Pipeline Co.
Richfield Oil Co.
Wilcox Trend Gathering System

MOTOROLA
COMMUNICATIONS & ELECTRONICS, INC.

The *Complete* Supplier of Radio Communications Systems
Motorola Communications & Electronics, 1400 N. Cicero Ave., Chicago 51, Illinois
A Subsidiary of Motorola Inc.

where "perfect" is not satisfactory...

Through the years, great strides have been made in the art of spooling wire line correctly and smoothly on hoisting rig drums with nearly all of the major advances being made by LeBus Engineers. Of utmost importance to these men has been their ability to improve on every method which they have developed. More efficient methods* for spooling wire line have resulted from their painstaking efforts to determine the need of the operator and act accordingly. Therefore . . . the Most Perfect wire line spooling systems in the World have come from LeBus.

*LEBUS COUNTERBALANCE SPOOLING

LEBUS

PERFECT SPOOLING

"COUNTERBALANCE"

The World's Most Perfect Method of Spooling Wireline

LeBus International Engineers, Executive Offices, Sales, Service & Warehouse • Longview, Texas

Patents Nos. Counterbalanced Spooling, Nos. 2,734,695; 2,772,179. Controlled Parallel and Helical Spooling, No. 2,708,069; 2,820,606. Levels of Spooling, Nos. 2,799,926; 2,804,273. Removable End Fillers, No. Other patents pending.

NOW!

J&L Buttress-Thread Casing

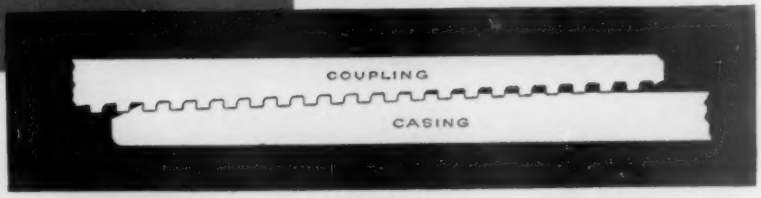
has high strength joint for toughest deep well drilling

High joint strength of J&L Buttress-Thread casing is attained by combined effect of completely engaged runout threads and the three-degree flank angle of the thread. Joint strength is almost equal to that of the body of the pipe.

Easy stabbing, rapid spinning and fewer power strokes to pull the coupling up to the power-tight position are provided by the unique thread design.

A superior casing is assured through use of quality steel, automatically controlled heat treatment, and new precision methods of machining, inspection and testing. Buttress-Thread casing is available in A. P. I. grades J-55, N-80 and P-110 as well as in still higher grades to meet special requirements.

Order this new J&L casing for use in your most severe and variable drilling operations. Write for complete information to the Jones & Laughlin Steel Corporation, Dept. 416, 3 Gateway Center, Pittsburgh 30, Pennsylvania.



Coupling threads (five per inch) engage casing threads throughout the entire length of a long coupling. The ¾ inch taper per foot is continuous and without the conventional fast angle vanishing threads. Full section of the casing is utilized in supporting weight of the string. Inside clearance of joint is not reduced by inside upsets.

J&L STEEL

Jones & Laughlin

. . . a great name in steel

LORAIN REPORT

OWNER: COLORADO INTERSTATE GAS CO.
DENVER, COLORADO

MACHINE: LORAIN-15 HOE

JOB: DIGGING PIPELINE TRENCH AT SUBSTATION. LORAIN ALSO USED ON FIELD PIPELINES

This ½-yd. Lorain-15 Hoe digs a pipeline trench at a substation near Denver, Colorado, for the Colorado Interstate Gas Co. This job is a snap for the "15" which also moves to the field for heavy-duty digging on pipeline right-of-way. Colorado Interstate Gas Co. has purchased two Lorains.

If you are looking for a big value in a ½-yd. hoe, the Lorain-15 will give you everything you are looking for. Though normally rated "½-yd.," the extra weight, strength and stability enable it to match the production capacity of many higher rated, more costly machines. There are many "big-time" features in this rugged hoe that make it outstanding in its class. Here are a few.

5 identical interchangeable shoe clutches • One-piece, all-welded, truss-reinforced, rigid turntable bed • 19 anti-friction bearings on power shafts and clutch drums alone • Oil-enclosed cut gears • "E-Z" operating controls—effortless action; fast response; longer clutch life • "Hydra-Ease" power control of crawler steering, tread lock, house lock, shifting of swing-travel jaw clutches. 16-in. cast-steel tread shoes — 22-in. and 29-in. available • Oil-enclosed crawler travel mechansim • 4-way position tread and travel lock, hydraulically powered and operated • Sealed idler rollers.

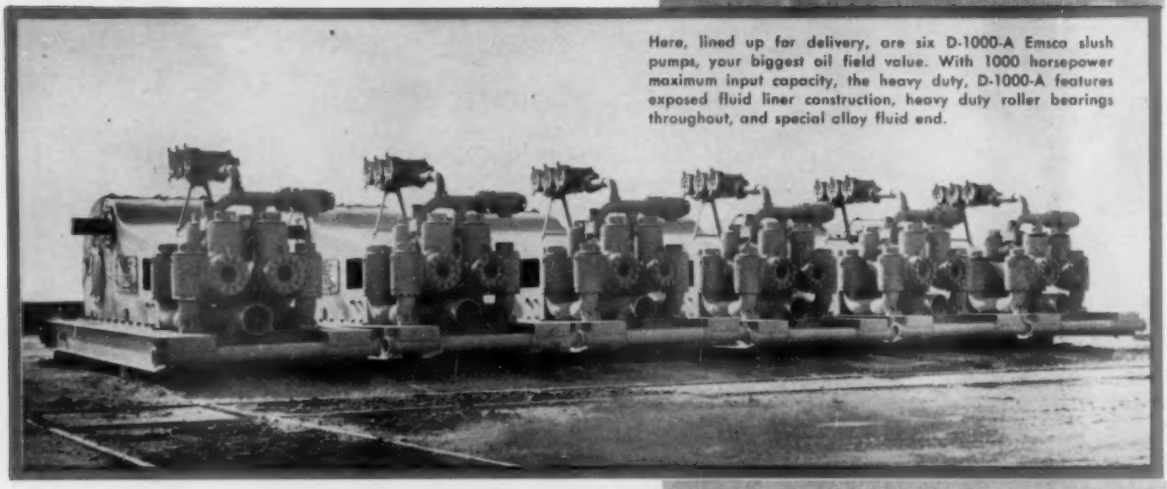
Hoe bucket sizes from 24-in. to 40-in. (¾-yd.) with two boom lengths—14 ft. and 16 ft.

Remember, too, that your Thew-Lorain Distributor offers the most complete line of sizes, crawler mountings and rubber-tire models through the 2½-yd. class. You can better equip your spread from the Lorain line than any other. Your Thew-Lorain Distributor can prove it to you.

THE THEW SHOVEL CO., LORAIN, OHIO

THEW LORAIN

"6000 Horses" For Heavy-Duty Drilling

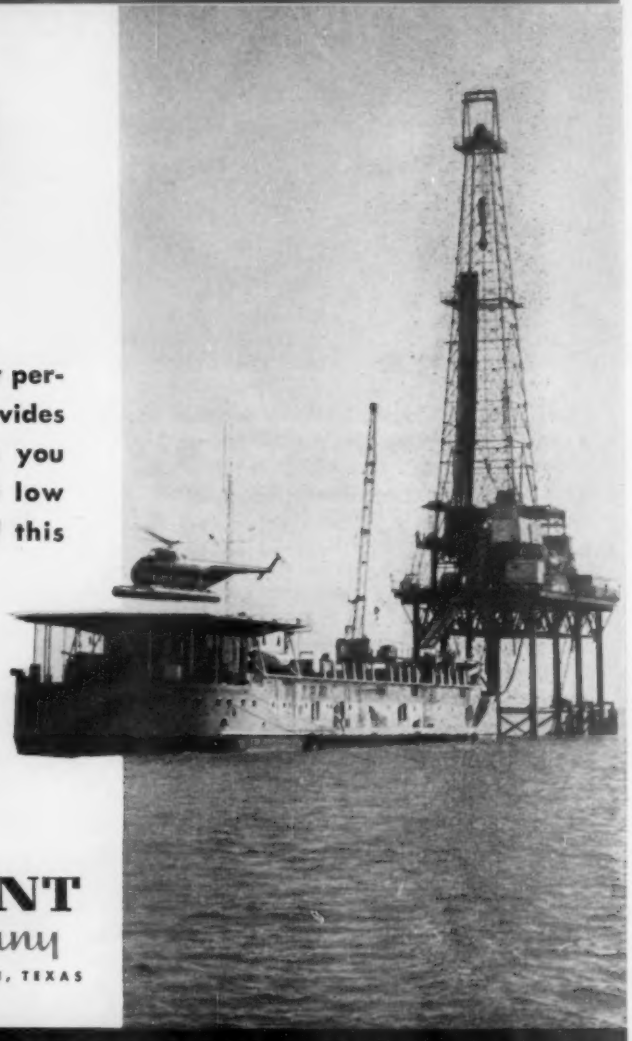


Here, lined up for delivery, are six D-1000-A Emsco slush pumps, your biggest oil field value. With 1000 horsepower maximum input capacity, the heavy duty, D-1000-A features exposed fluid liner construction, heavy duty roller bearings throughout, and special alloy fluid end.

EMSCO

REG U.S. PAT OFF

D-1000-A

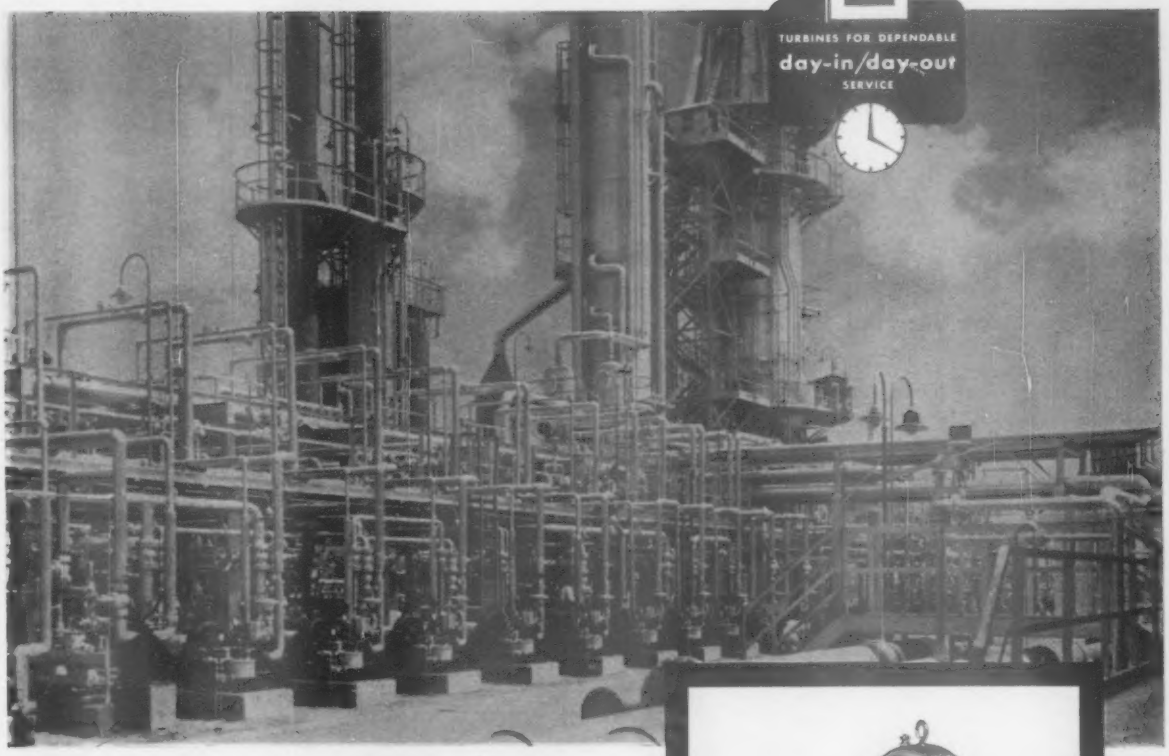


Designed and built for extra heavy-duty performance, the D-1000-A slush pump provides the high fluid pressures and volumes you need for deep hole jet drilling. The low weight high performance feature of this pump is made possible by Emsco's fabriform construction. Like all Emsco slush pumps, the D-1000-A is dependable, economical, and easy to maintain. Let your Mid-Continent representative show you how this Emsco pump performs on the deepest holes.

MID-CONTINENT Supply Company

MID-CONTINENT BLDG. FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

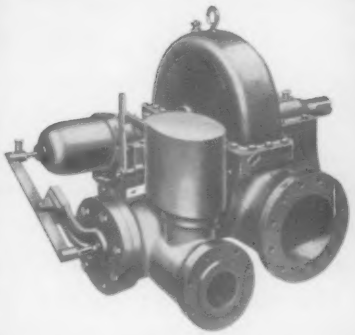


ELLIOTT YR TURBINES

the best anywhere . . .
serve refineries everywhere

When it comes to prime movers for process and water pumps, fans or compressors, Elliott mechanical drive turbines are the simple and reliable solution. Elliott single-stage turbines, ranging in size from 2 to 600 hp, are specifically designed to provide highest quality and long-term continuous service. In the cat cracker above, a southwestern refinery, 75 Elliott turbines furnish dependable driving power—24 hours a day.

The Elliott YR turbine design also permits easy inspection, simple replacement of wearing parts, and interchangeable components from one turbine frame to another. What's more, your local Elliott field engineer is always available for application engineering or for operating or maintenance assistance. Call today, or write Elliott Company, Steam Turbine Division, Jeannette, Pa. Ask for Bulletin H-22B.



6 design features you get with ELLIOTT YR single-stage turbines

- True Centerline Support for precise alignment, cold or hot, simplifies installation.
- Weather-Proofed, Reliable Governing System with separate overspeed trip and valve.
- Liner Type Bearings, easy to inspect or replace, rapid heat transfer to cooling oil, sealed against elements.
- Accessible Shaft Seals. Covers—not part of turbine casing—are easily removed for inspection or ring replacement.
- Self-Locating Rotor drops into position without adjustments. Entire rotor is dynamically balanced.
- Interchangeable Components permit interchanging of parts between turbine frame sizes, eliminates need for large inventories.

M7-1

ELLIOTT Company

Steam Turbines • Motors • Generators • Deaerating Heaters • Ejectors • Condensers • Centrifugal Compressors • Turbochargers • Tube Cleaners • Strainers

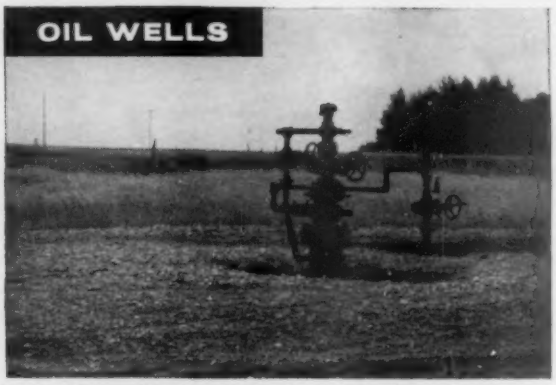
Keep areas weed-free . . . avoid fire hazards

Spray Du Pont TELVAR® WEED KILLERS just once for season-long weed control

You can eliminate weeds and grasses that create fire hazards and that make maintenance difficult and costly. Just one spray of Du Pont "Telvar" controls weeds for a season or longer. "Telvar" kills weeds through the roots, then remains in the soil to provide residual action long after the initial spray is applied. Low dosages save you cost, handling and storage space. "Telvar" weed killers are non-corrosive to equipment, non-volatile, low in toxicity to humans and animals. For low-cost, long-term control of weeds, include "Telvar" in your maintenance program.

TELVAR®
Monuron and Diuron
WEED KILLERS

DU PONT
REG. U. S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



Note the excellent control of weeds and grasses around this wellhead from just one application of "Telvar."

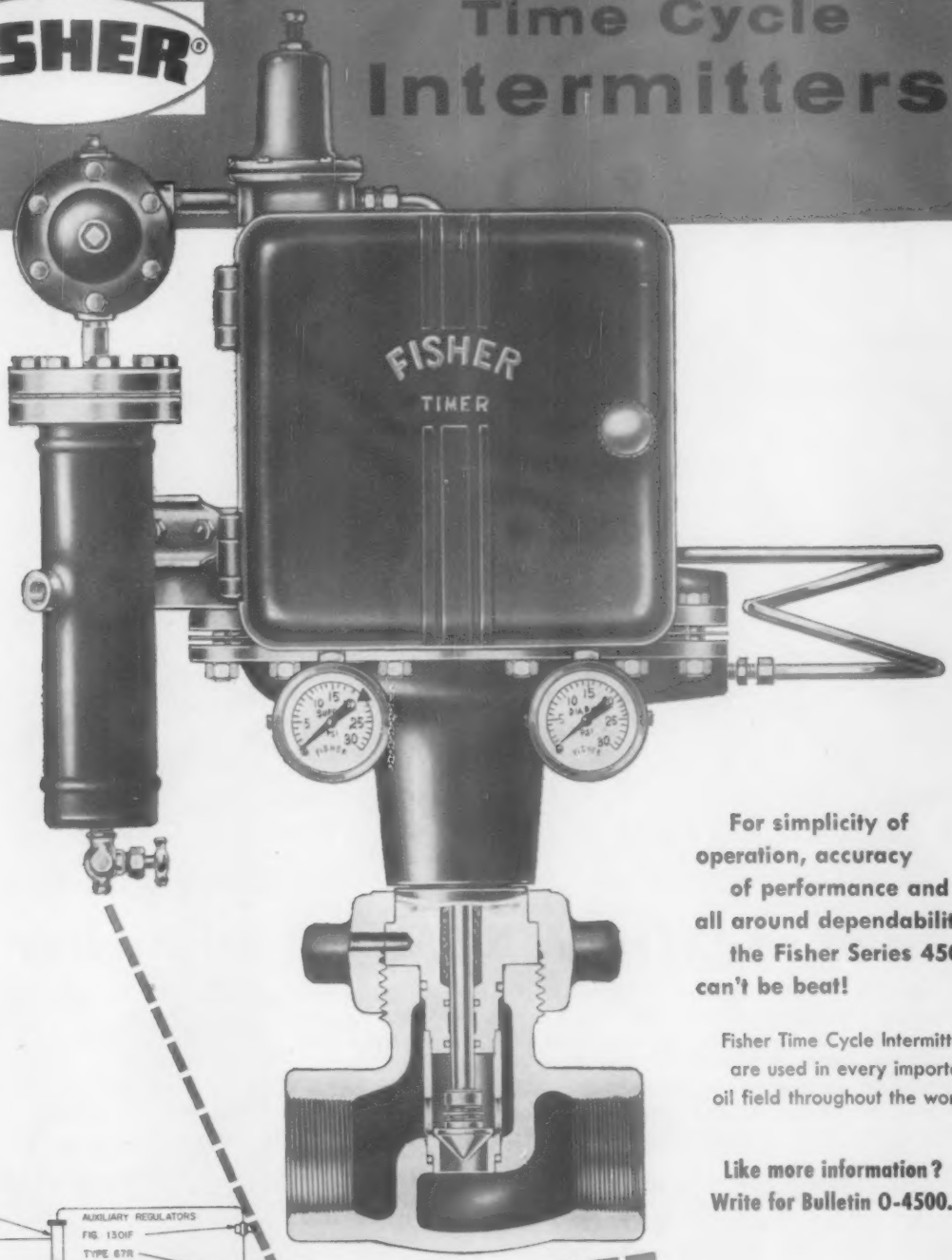
The treated area around this tank farm has remained weed-free for an entire season.

Along these pipelines, where maintenance is tough, one application of "Telvar" has kept the treated area weed-free for a year.

On all chemicals, follow label instructions and warnings carefully.

FISHER®

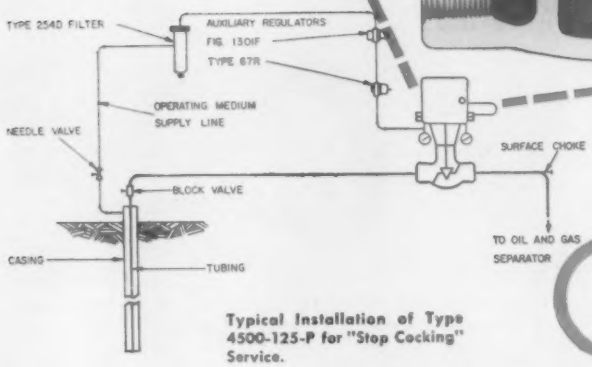
Time Cycle Intermitters



For simplicity of operation, accuracy of performance and all around dependability, the Fisher Series 4500 can't be beat!

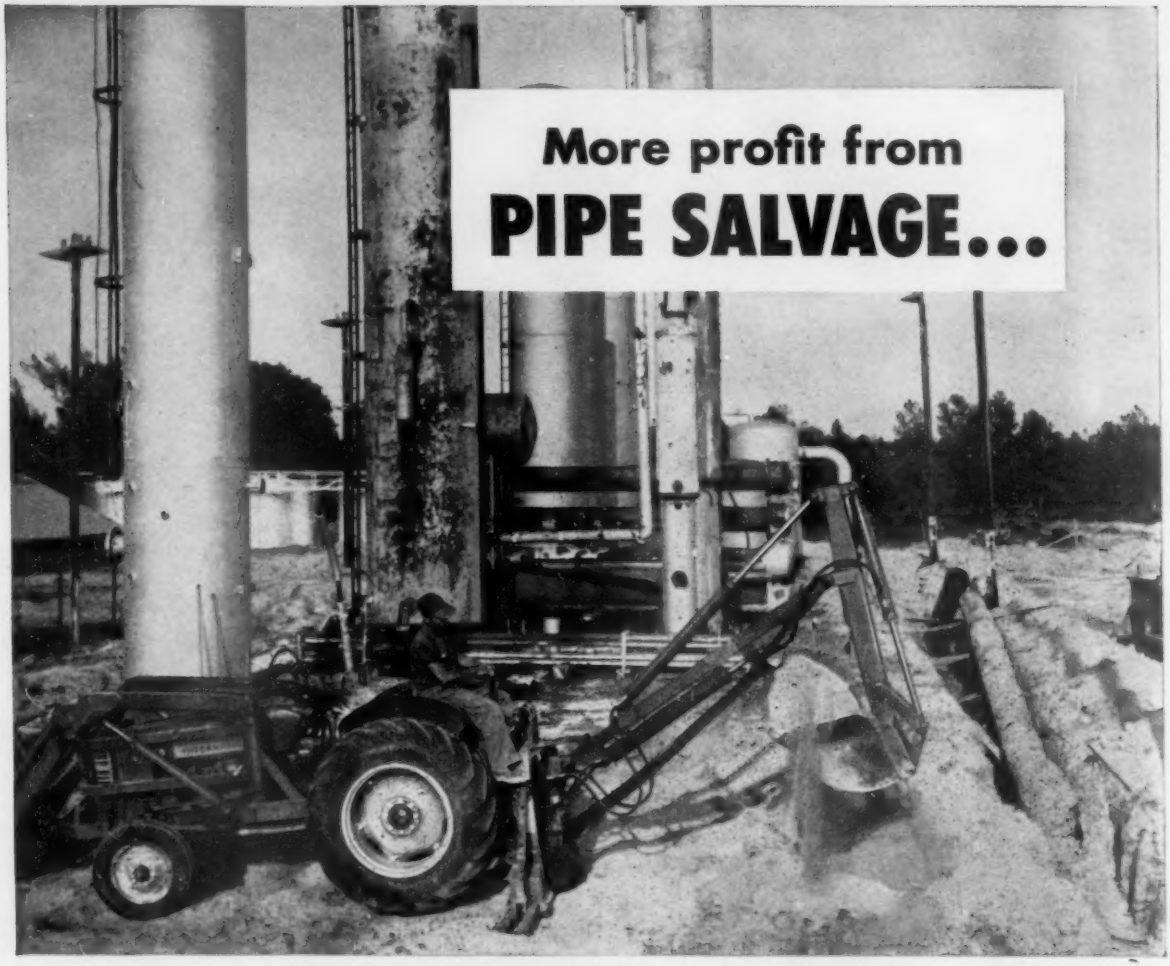
Fisher Time Cycle Intermitters are used in every important oil field throughout the world.

Like more information? Write for Bulletin 0-4500.



Typical Installation of Type 4500-125-P for "Stop Cocking" Service.

FISHER GOVERNOR COMPANY
Marshalltown, Iowa • Woodstock, Ontario



More profit from PIPE SALVAGE...

with an INTERNATIONAL® 350 Utility tractor

Salvaging a web of criss-crossed pipe in soil dense-packed by years of refinery operation takes a tractor with *brawn!* It takes a tractor with built-in weight and strength to make the backhoe bucket bite and fill on every digging stroke.

The new International 350 Utility gives you this strength and stamina, with up to 1,000 pounds greater weight—capacity* to boost trenching yardage as much as 25 per cent. Greater power and weight also provide *traction* to bull loader buckets full. Integral *power steering* gives easy, one-hand maneuverability, even with a heaped half-yard loader bucket. *So try it* . . . you'll *outwork them all* with a new International 350 Utility!

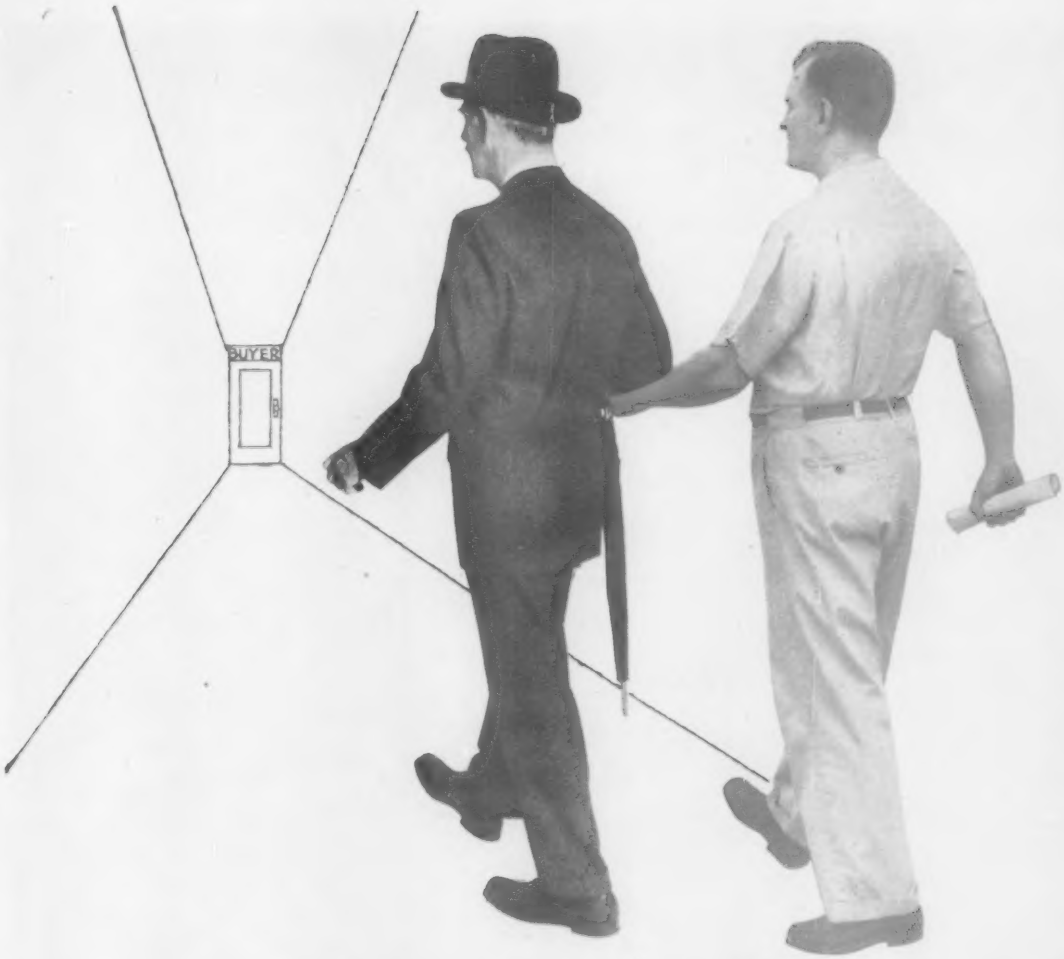
There are over 5,000 IH Dealers to give prompt sales-service *wherever* your jobs are located. The one closest to you will be glad to demonstrate. Look in the classified directory . . . phone today!

IH® SEE YOUR

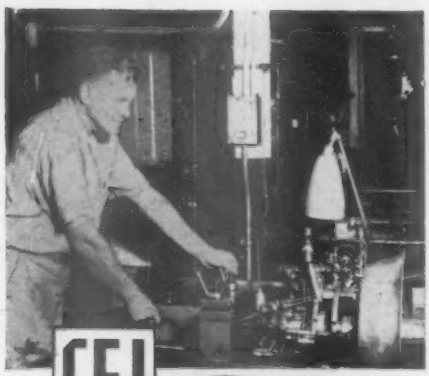
INTERNATIONAL HARVESTER DEALER

International Harvester products pay for themselves in use—McCormick Farm Equipment, Farmall and International Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois

Rock-bottom trenching cost is yours with an International 350 Utility and rear-mounted trencher. Digs trenches 5 to 14 inches wide, as deep as 6 feet for field collector lines. Variable speed drive, 0 to 600 feet per hour.



Your Wickwire Rope Distributor and our closer operator ...ready to help you



This closer operator—running a machine which forms our rope—is with your Wickwire Rope Distributor every time he makes a call.

True, he's physically in the mill, where he's carefully conducting this final fabricating operation. But, whenever your Wickwire Distributor makes a call, he has the full assurance that every foot of Wickwire Rope has been carefully assembled by skilled craftsmen . . . and that it will give you long, trouble-free service on your job.

It's just one more reason why your Wickwire Distributor knows he's got top-quality wire rope, slings and strand to sell . . . and that these products will serve you well.

4083

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

FIRST 500-ton Capacity Elevator!

FIRST 500-ton Capacity Spider!

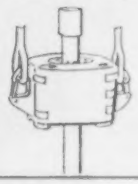
FIRST Combination Elevator & Spider!

Introducing BJ's NEW 500-ton Elevator-Spider

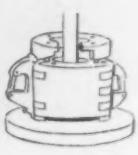
This tremendous new tool serves as either a casing elevator or as a casing spider. Its 500-ton capacity gives it a super-strength grip for holding the heaviest string of casing ever run or contemplated. Yet it is so simple and so functional that it can be easily operated by one man. Interchangeable slip assemblies and inserts make it capable of handling all casing sizes from 4½" to 10¾". This 5000-pound giant is designed for the deep drilling operations of today and of the future.

Write for bulletin containing complete specifications.

USED AS AN ELEVATOR



USED AS A SPIDER



WATCH BJ FOR THE NEWEST

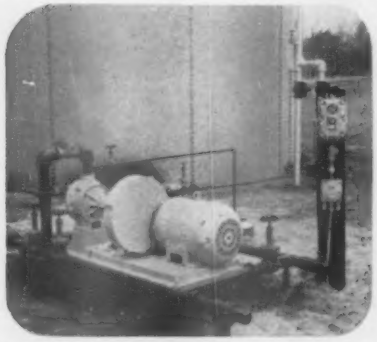
Byron Jackson Tools, Inc.

A SUBSIDIARY OF BORG-WARNER CORPORATION

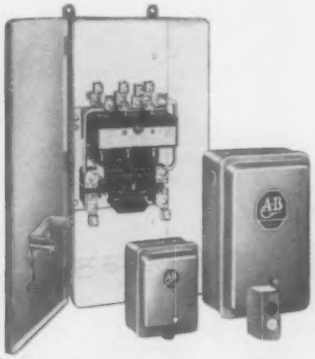
P.O. Box 2017A, Terminal Annex, Los Angeles 54, California • Cable: "BJTOOL"
Export Address: 580 Fifth Avenue, Suite 510, New York 36, New York

TROUBLE FREE MOTOR STARTERS FOR THE OIL FIELDS

Most starters, in the oil fields, must be watertight or explosion-proof. This calls for bolted enclosures which are a time-consuming job to open and close for inspection. The way to lick this situation is to install Allen-Bradley solenoid starters, because they do not need regular inspection. The double break, silver alloy contacts are always in good operating condition. Furthermore, their simple construction . . . only one moving part . . . does away with pins, pivots, bearings, or jumpers. You can safely install Allen-Bradley starters . . . and practically forget them. They are good for millions of trouble free operations.

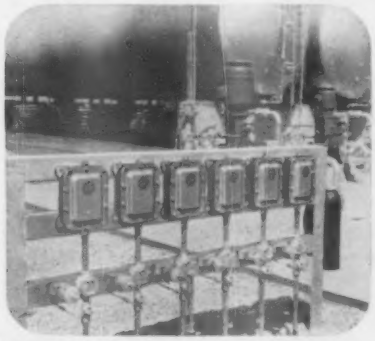


CIRCULATING PUMP (one of 28 pumps with Allen-Bradley starters) in Neches, Texas.



Allen-Bradley solenoid starters are available in 8 sizes—up to 300 hp, 220 v; 600 hp, 440-550 v.

PUMPER (one of 17 equipped with A-B weather-proof starters) in Oklahoma.



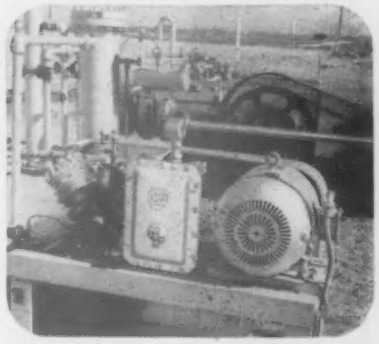
LOADING PUMPS with A-B explosion-proof starters in Denton, New Mexico.

The two outstanding reasons for the popularity of Allen-Bradley solenoid starters in the oil fields:

1st—Simple construction . . . ONLY ONE MOVING PART.

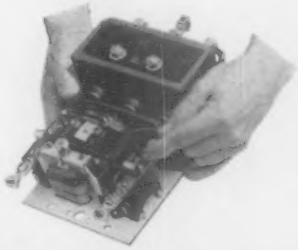
2nd—Contacts require no cleaning, filing, or dressing.

No pins, pivots, or bearings to gum up and stick . . . no flexible jumpers to break.

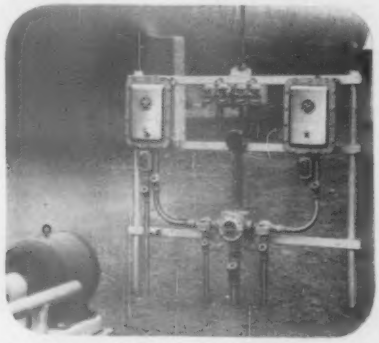


COMPRESSOR with A-B starters at L.P.G. loading terminal at Stanton, Texas.

TANK FARM installation of Allen-Bradley watertight starters in Lake Charles, La.



Two thermal solder pot relays give accurate, dependable overload protection. They are reliable even after long inactive service.



LOADING PUMP with A-B controls at L.P.G. terminal in Midland County, Texas.

Allen-Bradley Co.
1304 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

OFFSHORE DRILLING RECORD

30,394 feet in 105 days with GM Detroit Diesel Power

C. G. Glasscock Drilling Company's mobile unit "Mr. Gus" holds the present record for offshore drilling—two wildcats totaling 30,394 feet of hole—as far as 63 miles from shore and in water as deep as 93 feet. And all this in the first 105 days' operation, despite the loss of several days fighting lost circulation. The power—16 General Motors Detroit Diesel "6-71" engines on draw works and pumps, plus 4 more "6-71's" on lighting generators.

And now an even bigger brother is coming. The most powerful Diesel-Electric plant ever used on an offshore rig is being installed by Stewart & Stevenson Services, Inc., aboard "Mr. Gus II," now being built for Glasscock at Bethlehem Shipyard, Beaumont. Primary power for "Mr. Gus II" consists of five Stewart & Stevenson S24-1000 Rigelectric units—each composed of two 600-h.p., d.c. generators, driven by four Series 110 GM Detroit Diesel engines—6,000 h.p. on the drilling equipment. For the world's fastest, most flexible drilling power, see your GM Detroit Diesel distributor or dealer.

GM GENERAL MOTORS DETROIT DIESEL POWER

DETROIT DIESEL

Engine Division of General Motors, Detroit 28, Michigan

REGIONAL OFFICES: New York, Atlanta, Detroit
Chicago, Dallas, San Francisco

Factory Engineered Parts—Factory Trained
Servicemen everywhere

"Mr. Gus" has 20 GM "6-71" Detroit Diesel engines, 16 driving Ideal draw works and pumps and 4 powering 150 kw. generator sets

ALABAMA—Birmingham, Montgomery
ARMSTRONG EQUIPMENT CO.
Mobile
KENNEDY MARINE ENGINE CO.

ARIZONA—Phoenix
DIESEL SERVICE COMPANY

CALIFORNIA—El Monte, Long Beach, Los Angeles
ANDERSON-O'BRIEN CO.

COLORADO—Denver
THE COLORADO BUILDERS' SUPPLY CO.

FLORIDA—Jacksonville, Miami
DETROIT DIESEL ENGINE DIVISION
General Motors Corporation
(Florida Branch)

ILLINOIS—Mt. Carmel
WESTERN SERVICES, INC.

INDIANA—Evansville, Indianapolis
REID-HOLCOMB CO., INC.

IOWA—Sioux City
FEHRS TRACTOR & EQUIPMENT CO.

KANSAS—Great Bend, Wichita
DIESEL EQUIPMENT CO., INC.

KENTUCKY—Lexington, Louisville, Madisonville
BOGIE EQUIPMENT CO.

LOUISIANA—Harvey
GEORGE ENGINE CO., INC.
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PENINSULAR DIESEL, INC.

MISSISSIPPI—Biloxi
KENNEDY MARINE ENGINE CO.

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K. C. DIESEL POWER CO.
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NEW MEXICO—Albuquerque
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NORTH DAKOTA—Williston
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OHIO—Cleveland, Toledo, Youngstown
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DIESEL POWER CO.

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HIGHWAY EQUIPMENT CO.

TEXAS—Beaumont, Corpus Christi, Dallas, Houston, Lubbock, Odessa, San Juan
STEWART & STEVENSON SERVICES, INC.
El Paso
EQUIPMENT SUPPLY CO., INC.

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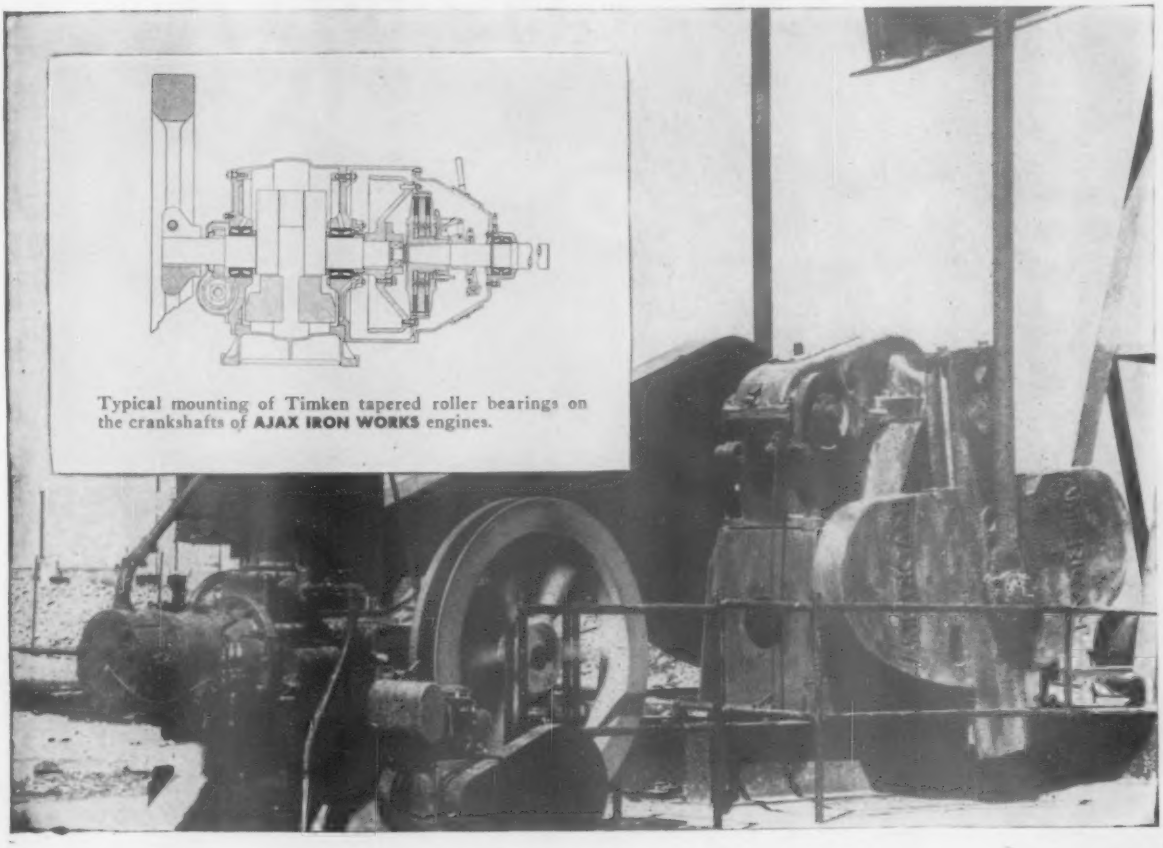
WEST VIRGINIA—So. Charleston, So. Fairmont
RAY C. CALL, INC.

IN CANADA—Distributors in all key locations under
GENERAL MOTORS DIESEL LIMITED
London, Ontario

More horsepower, less maintenance

...crankshaft mounted on TIMKEN® bearings



Typical mounting of Timken tapered roller bearings on the crankshafts of **AJAX IRON WORKS** engines.

IMPROVED cylinder and piston design on Ajax Iron Works' heavy-duty DP-70 11 x 14 engine boosts horsepower 27%, at 350 rpm. Features include a direct drive rotary lubricator, rotary magneto, better counter-balancing, and power take-off type of clutch, and a crankshaft mounted on Timken® tapered roller bearings.

Timken bearings hold the crankshaft in correct alignment. Tapered construction lets Timken bearings take radial and thrust loads in all combinations. Geometrically designed to give true rolling motion, Timken bearings are precision-made to conform to their design. As a result, Timken bearings normally last the life of the engine.

As Ajax has learned through countless hours of trouble-free performance, Timken bearings permit virtually *unattended* engine operation. Full line contact between rollers and races means extra load-carrying capacity—and Timken bearings make closures more effective in sealing out dust, dirt and moisture, keeping lubricant in, by holding shafts and housings concentric. Maintenance is greatly reduced.

When you build or buy oil field machinery, look for the trade-mark "TIMKEN" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.

✓Totally Enclosed
✓Class H Insulation
-at no extra cost

ALLIS-CHALMERS
Dry-Type
TRANSFORMERS

FORGET all about maintenance with this Allis-Chalmers totally enclosed, 150 C rise, dry-type transformer. No dirt, dust, moisture or lint can get at it. Use it indoors or outdoors. It is completely weatherproof.

Class H insulation used throughout the coil structure results in long insulation life. Case temperatures are low—do not exceed maximum of 40 C rise. All safety requirements are easily met. No vaults or barriers are needed.

Modern design features result in a compact, convenient transformer that will give years of satisfactory operating life. All these advantages are available at no extra cost.

For Complete Information, call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

1. Coil has maximum insulation life with Class H (150 C rise) insulating materials.

2. Simple, sturdy, totally enclosed weatherproof case has just one welded seam.

3. Recessed bottom plate has eight bolts for positive closure, yet gives quick accessibility.

A-5126

ALLIS-CHALMERS

LIVE BETTER ELECTRICALLY

How to cut line-up and welding costs by 20%

Lining up and welding sections of a pipe line costs a lot of money. But here's how Armco Welded Steel Pipe can help you reduce these costs as much as 20 per cent.

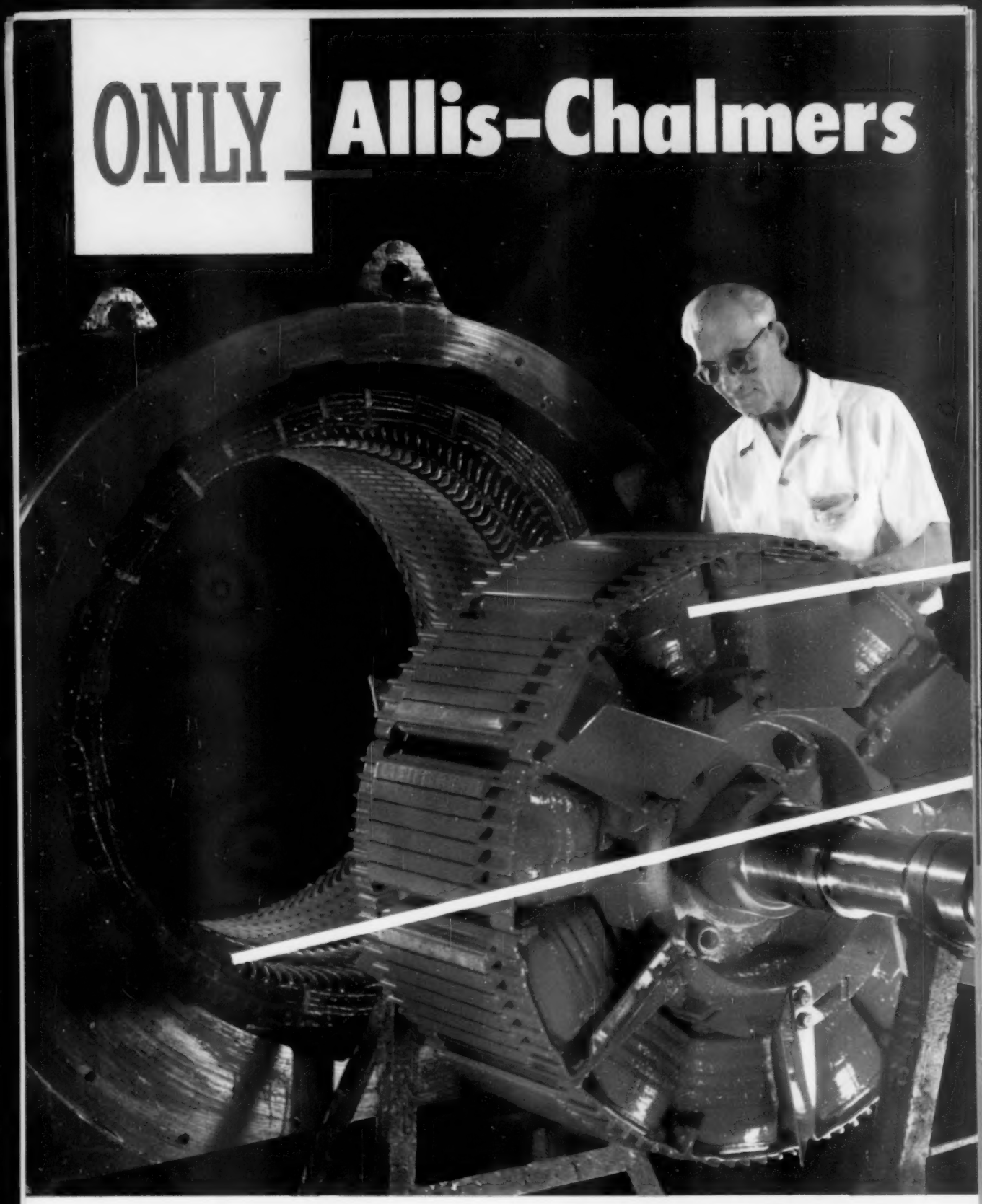
Armco Line Pipe is supplied in standard 50-foot lengths instead of the usual 40-foot or double-random lengths. This means at least 20 per cent fewer field joints. Line-up and welding time is reduced and you have fewer sections to handle.

What's more, the wide range of diameters—6 to 36 inches—and wall thicknesses—¼ to ½-inch—available in Armco Pipe lets you use exactly the right size for your particular requirements.

Use Armco Welded Steel Pipe for requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe. Write for data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 4317 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

Armco Welded Steel Pipe

ARMCO®



ALLIS-

MOTORS are "double protected"

New Integrated Field Coils Plus *Silco-Flex* Stator Insulation Provide Superior Motor Protection... Under Any Operating Conditions

1

Integrated Field Coils are bonded in heat-stabilized resins, enclosed in a resin-impregnated sheath of oriented glass fibers and bond-locked on the pole structure . . . dimensionally stable to withstand heating and thermal shock, vibration and fatigue at elevated temperatures . . . sealed throughout against atmospheric contaminants and fully protected against destructive forces.

2

***Silco-Flex* Insulation** provides a homogeneous, void-free insulating wall of silicone rubber on stator coils. It is unexcelled in life and thermal stability at high temperatures . . . resistant to most chemicals, water, weather . . . outstanding in flexibility and resilience . . . able to withstand abrasion and corona . . . resistant to physical and mechanical forces.

Exclusive Allis-Chalmers "double protection" is available on large electrical machines with operating temperatures through Class B range.

Silco-Flex is an Allis-Chalmers trademark.

For more information on these quality insulation systems contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin for Integrated Field Coil Bulletin 05R8525 and *Silco-Flex* Insulation Bulletin 05R8341.

Allis-Chalmers "Double Protection," with integrated field coils and Silco-Flex stator coil insulation, adapts this 600-hp, 2300-volt, 600-rpm synchronous motor to the most severe operating conditions.

CHALMERS

A-C ALLIS-CHALMERS

A-5221

Clear proof you can prevent plugging caused by iron in injection water!
CITRIC ACID ADDED
In this glass, only 10 ppm of Pfizer Citric Acid has been added to brine containing 2 ppm iron
NO CITRIC ACID
The brine in this glass also contains 2 ppm iron. But no citric has been added

● The cloudiness of the brine at right is caused by insoluble iron salts. Continuous injection of this water in secondary recovery causes plugging at the interface.

As you can see from the picture on the left above, Pfizer Citric Acid keeps the iron in your injection water from precipitating out...and thus piling up deposits at the interface.

Net result: Regular use of Pfizer Citric Acid will keep your injection rates high easily and economically. Also cuts down the frequency of expensive acidizing.

Pound for pound, citric acid sequesters iron better and at less cost than any other agent. High calcium and magnesium waters will not interfere with citric's iron-sequestering ability.

Nontoxic, safe to handle—Pfizer Citric Acid is excellent preventive medicine—whether for secondary recovery or pressure maintenance work. Pfizer supplies huge amounts of citric acid for a multitude of industrial uses throughout the world. This broad distribution pattern assures you of receiving all the citric you need without delay. (Just recently, Pfizer has opened a new warehouse in Dallas to serve the Southwest.)

For further information on preventing injection well plugging with Pfizer Citric Acid write to:

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Always nearby—always in ample supply—always top quality! That's why it pays to *specify* Yellow Strand Wire Rope for your equipment.

Yellow Strand is always on hand at your nearby Broderick and Bascom Distributor. He is probably the same man who takes care of your equipment, parts and service needs. He is served by a nearby B & B factory or warehouse.

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Wherever your job takes you *and whatever the nature of your contract, there's a Yellow Strand Distributor nearby. He's ready to expertly assist you in specifying the proper wire rope for your equipment. Stocked by Continental-Emsco Company throughout mid-continent and Rocky Mountain fields.*

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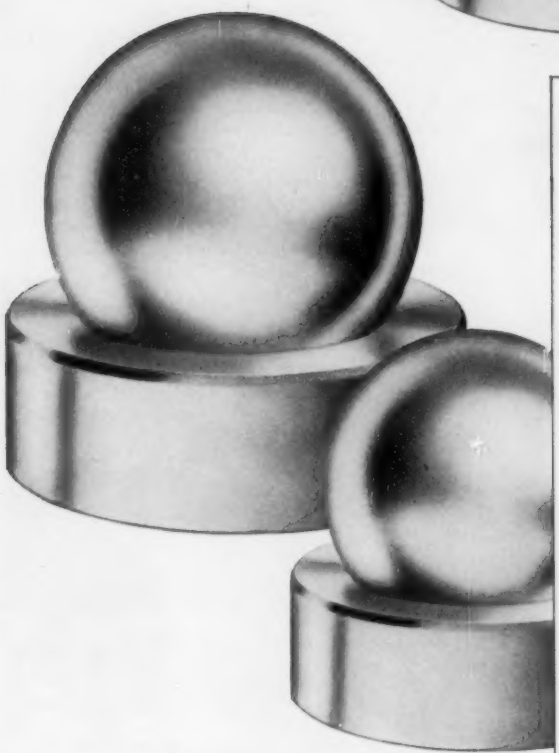
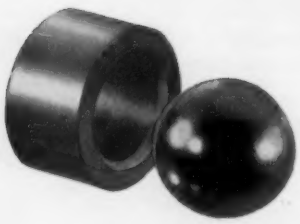




REPORTS OF PERFORMANCE

from users during the past 16 years show that Kennametal* lasts 20 times longer than steel and 3 to 5 times longer than special and super alloys.

- A Texas producer reported sand abrasion forced a pulling job every 14 to 20 days. After 448 days on the job, Kennametal Balls and Seats showed no wear when well was pulled for other than valve job.

Kennametal wear parts in this Otis bottom hole regulator provide 12,000,000 closures under 1200 psi in sand-sulfide fluid. Used parts illustrated have already given 3,628,000 closures in six months service, from 7000 feet.

Kennametal API Balls and Seats are available at repair shops of most major pump manufacturers. Ask your service man to standardize on them. They'll cost you less in the long run. KENNAMETAL INC., Dept. OG, Latrobe, Pa.

*Kennametal is the Trademark of a series of hard carbide alloys of tungsten, tungsten-titanium and tantalum.

INDUSTRY AND
KENNAMETAL
...Partners in Progress

Deep in the Earth There's Another Reason Layne's on Top!

THE LAYNE IMPELLER is that reason, because a pump can be no better than its impeller.

There are two main considerations in impeller evaluation—QUALITY AND PERFORMANCE.

QUALITY—The materials used in the manufacture of a Layne impeller must be tough, durable and possess excellent *surface quality* and they must be able to insure *dimensional accuracy*. Metal patterns are used in casting high quality phosphor gear bronze into Layne impellers. Other special metals are specificed when necessary.

PERFORMANCE—A Layne impeller is correct in hydraulic design based on 75 years of Layne experience through thousands of successful installations and tests. Correct impeller design determines a pump's performance in any particular hydraulic condition.

Each Layne impeller is precision manufactured. Because no one technique is adequate, both hand finishing and special machining are used in balancing and tooling the impeller. Working to a rigid and minimum tolerance, specially designed gauges and instruments check each step to the finish of a Layne impeller . . . from water passages and angles to vane thickness.

Layne impeller sizes range from 4" diameter and up, as specified.

The result — an impeller which operates deep in the recesses of the earth dynamically in balance. Each remaining component part of a Layne pump receives the same careful engineered attention, and when assembled assures complete pump perfection giving you years of trouble-free service.

Layne's 75 years of experience puts Layne on top!

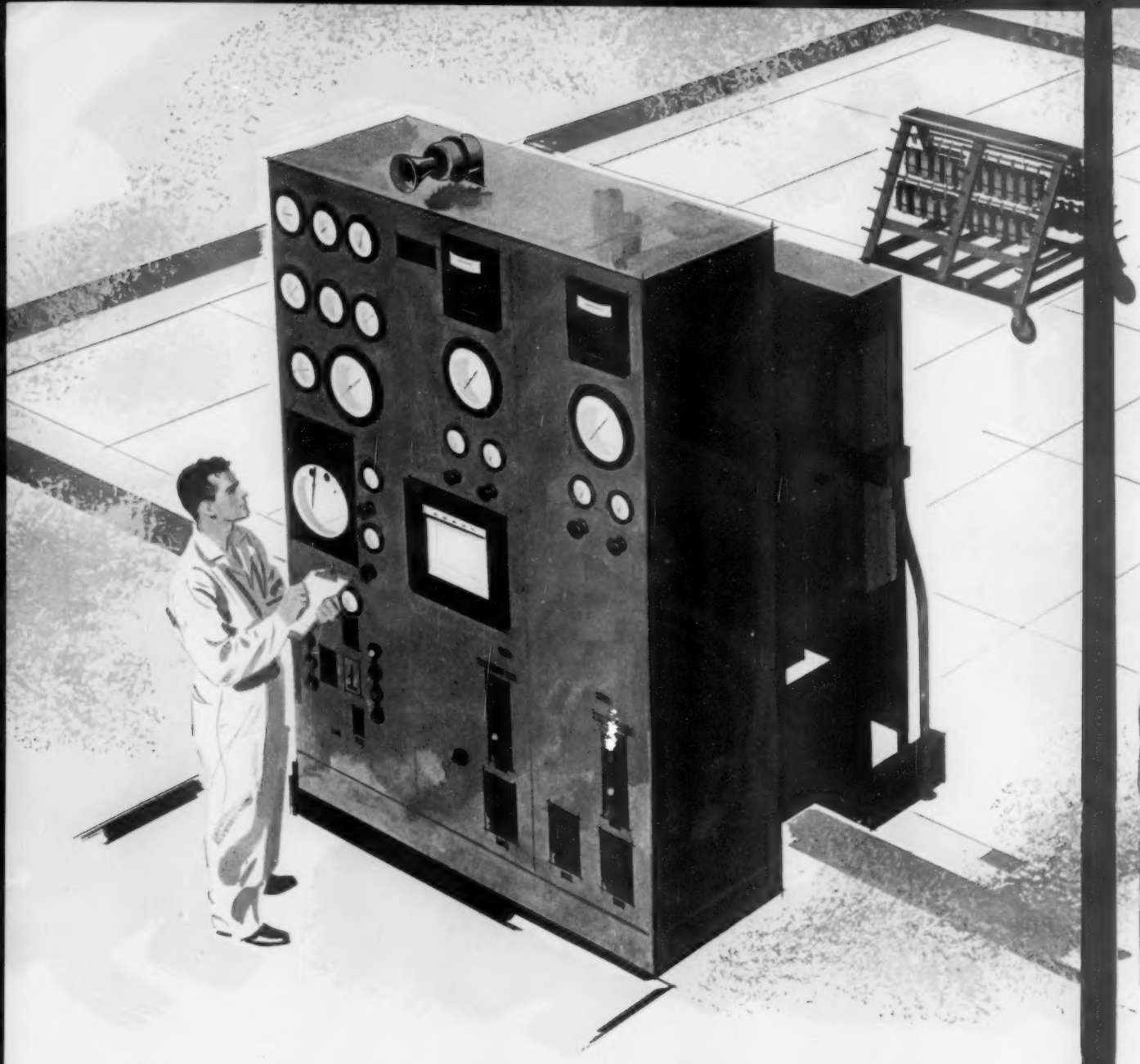
1882 — 1957
Layne
75 YEARS OF PROGRESS

WATER WELLS • VERTICAL TURBINE PUMPS • WATER TREATMENT

LAYNE & BOWLER, INC. MEMPHIS

General Offices and Factory • Memphis 8, Tennessee

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD



They set a new "drilling record" every day

When Schlumberger constructed its high pressure laboratory more than five years ago, drilling depths had barely exceeded 20,000 feet and bottom hole temperatures had seldom passed the 300 degree mark.

Yet the test wells in this Schlumberger laboratory were designed and constructed to reach 450 degrees maximum operating temperature and 25,000 psi working pressure, hydrostatically tested at 37,500 lbs.

As a result, Schlumberger had the cables, instruments and perforating guns perfected and ready to meet the challenge of extreme depths, pressures and temperatures when the present record well was drilled in Louisiana.

Since 1934, Schlumberger has logged every record depth well. And laboratories such as this, where extensive research into future drilling conditions is conducted years ahead of the actual need in the field, is only one of the reasons why Schlumberger is always ready.

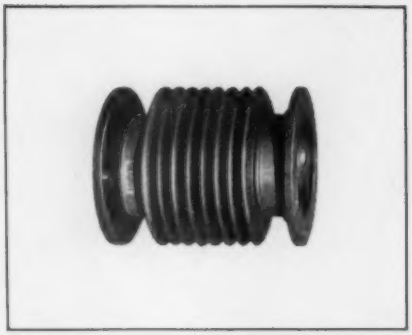
The unparalleled backlog of research and experience which Schlumberger offers is reflected in the quality and service you receive on every survey, regardless of depth.

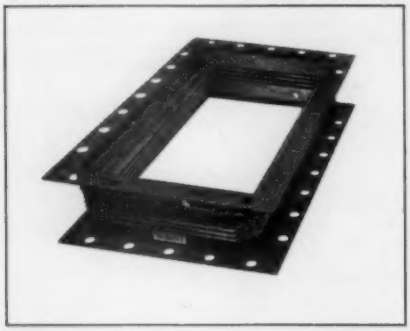
SCHLUMBERGER

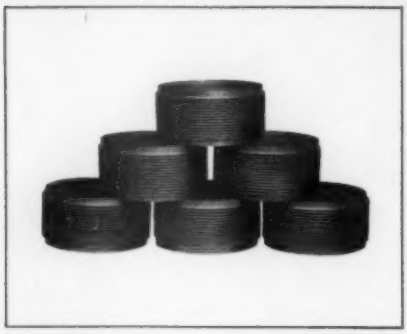
Well Surveying Corporation

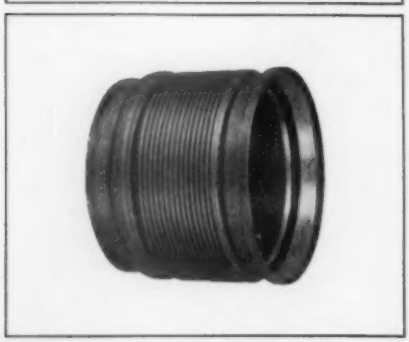
THE EYES OF THE OIL INDUSTRY

Schlumberger...to be sure!









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EXPANSION JOINTS AND BELLOWS ARE MADE IN ALL SIZES AND VARIETIES

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THE SOLA-FLEX LINE is the most comprehensive in the world. It includes many basic types of expansion joints—convoluted, U-span, rectangular, and others. Sizes range from ½ in. to 35 ft in diameter. Pressure ranges run from complete vacuum to standard 900 psi test and to higher pressures on special designs. Bellows have been built for service from—300 F to 2000 F. Materials used include all types of steels and a variety of high alloys.

Pipe expansion problems increase with higher pressures, temperatures and smaller space. Sola-Flex joints provide the answer—with economy and efficiency. Write for catalog today. Dept. C-143, Solar Aircraft Company, San Diego 12, California.

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The cheapest and most dependable power in the oil producing business has always been provided by the horizontal, two cycle, crosshead type gas engine. This was true for the old-timers and it's true today. The only difference is in the engines!

Today's Ajax Gas Engine is a highly-engineered, precision product. Retaining all the essential simplicity of its great prototype, the Ajax you buy today is a product of the best design, the finest craftsmanship and the most suitable materials it is possible to obtain.

And Mr. Producer, if gas is obtainable, Ajax will deliver cheap power! *Ask your Supply Man for the particulars.*

Ajax MODERN GAS ENGINES

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- HORIZONTAL
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SIMPLICITY
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J&L DRILL PIPE

J&L Supply offers you a dependable source of high quality drill pipe for deep or shallow drilling, and to accommodate various types of tool joints.

Available in Grades D and E, Blue Ribbon Heat Treated Alloy, and Blue Ribbon Plus Vanadium Heat Treated Alloy steels (105,000 psi minimum yield).

Interested, capable service everywhere—call your nearest J&L Supply representative.

The deepest well in the world, drilled in South Louisiana from the barge Keystone with J&L Blue Ribbon Plus Vanadium Drill Pipe to total depth of 22,570 feet. There was not a single pipe failure.

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NO MORE
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Point horn, pull trigger, fire's out! That's all it takes to knock out deadly oil, gasoline, flammable liquid fires with instant-action Kidde dry chemical portable extinguishers! So easy to use, even inexperienced operators get perfect fire-fighting results. Kidde's patented diffuser horn spreads dry chemical powder over wider area for greater fire-killing power. Trigger-finger grip means faster action, feels more natural in the hand. Pick the Kidde dry chemical portable to fit your needs: 5, 10 lb. pressurized (recharged at any commercial air pump), 20, 30 lb. cartridge-operated. For more information, write today for Kidde's P-8 catalog and name of nearest distributor.

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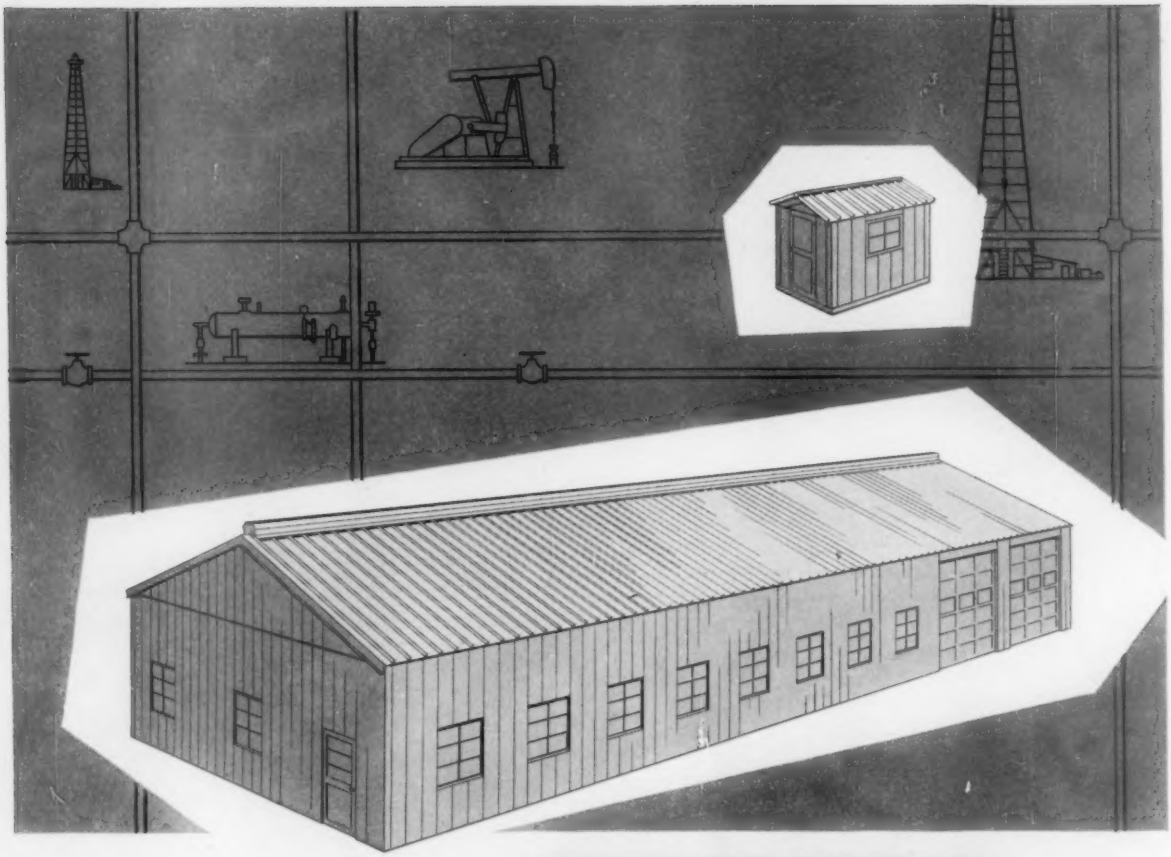

a vital part of the picture . . .

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Parkersburg's top-quality, pre-engineered metal buildings are serving in hundreds of different ways to provide quick, rugged, weather-tight construction in the field. These precision-fitted units feature unique "seven-fold" interlocking joints offering the tightest, most rigid weather seal available today.

Parkersburg metal buildings can be moved or enlarged . . . be finished or insulated . . . will withstand driving rain, dust, snow, and high winds. They can be erected quickly and economically into attractive units ranging in size from tool sheds to large storage or factory buildings.

Look into the many Parkersburg advantages today . . . Write to Department B-2 for additional information. The Parkersburg name is your guarantee of unequaled quality.

60 years of successful service!

"WISE IN THE WAYS OF METAL BUILDINGS"

BUILDING PARKERSBURG DIVISION

THE PARKERSBURG RIG AND REEL COMPANY
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Factory Locations: Parkersburg, West Virginia; Pomeroy, Ohio; Coffeyville, Kansas; Houston, Texas.

Building Division Sales Office: Dallas, Atlanta, New York, Chicago, Parkersburg.

They Say—

Oil Goes to the Woodshed

Dear Sir:

The spectacle of today is that of the oil industry going to the woodshed followed switch in hand by the midget mentalities of government brass, politicians, and lawyer-clerks who will forcibly bend the sound business will of the industry's leaders to the "rock and roll" era of thinking.

The oil industry is looked upon by government hands as lousy rich and, therefore, not entitled to increase the price of its commodity. General Motors has reported profits of a billion dollars a year. If the oil industry's leaders had one-tenth the guts and vote-getting ability of the union leaders, then it too could continue to bask in the bright rays of affluence without being the target of Washington professors.

John L. Hill
Houston, Tex.

Independent at Senate Committee

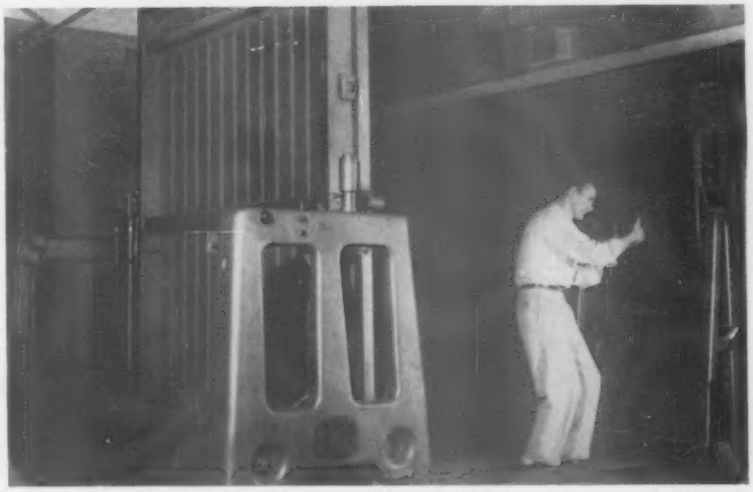
"The major importing companies have in the field what is, clearly, a stranglehold on the independent's position. The power to strangle the independent has, until now, not been exercised because of the equality under state conservation laws and because so long as there was a pressure and necessity to maintain the health of the domestic industry, the giant companies had a self interest in supporting—rather than strangling—the independent.

"When an independent brought in a well, the majors had an interest in making a connection, adding that oil to their domestic supply. Today, however, there are more than 8,000 wells unconnected in Texas alone. When it was in the interest of the majors to stimulate development of our domestic oil reserves, the crude prices paid to independents were generally kept in line with the realistic capital needs of the independent. Today—even with the recent crude increase—crude prices are not adequate to pay replacement costs.

"As I see it, . . . we now have two oil industries operating in this country: A true domestic industry, made up of the many independent producers and the refiners and integrated companies which are not importers; and we have an international oil industry, of which the American importers are a part.

"The problem lies in the fact that the domestic oil industry is operating

DRAFTING TRENDS



A good cameraman is one key to making high quality cloth reproductions.

Cloth reproductions safeguard originals, save drafting time

Many priceless original drawings are subjected to constant punishment. Corners become dog-eared (from filing and handling) and base stock is abused through repeated erasures when elements must be redrawn. In addition, drawings are prematurely aged and discolored as they go through a reproduction machine time after time.

An increasing number of plants are turning to reproductions on durable cloth stock to protect original drawings. The cloth repro is actually a "duplicate original." It can be repeatedly erased, corrected, intensified, redrawn, used for further printmaking. Negatives can be assembled with sections from other drawings. Expensive original drawings can thus be permanently and safely stored.

How photography improves worn original drawings

Since one method of producing a cloth reproduction is via photography, good camera work improves original drawings in several ways. Weak, fuzzy lines are intensified. Differences in strength of lines are often equalized. Faded or weak areas can be strengthened.

Even *after* an original drawing has been photographed, it can still be improved. A good retoucher can bring back parts of the original drawing. Background smudges or tape marks can be blocked out to give good, clear, clean prints.

By using photographic techniques, cloth repros can be *better than the original.*

Cloth repros simplify enlarging, reducing

Photographic enlargement or reduction to scale eliminates much routine work. By turning details over to the camera and an experienced staff, draftsmen are released for more important layout and design work. Often in a matter of one or two days, you can have a drawing enlarged or reduced to the desired size on a cloth base *without losing valuable drafting time.*

More information on cloth reproductions and a sample print are available from the Reader Service Division of the Frederick Post Company, 3644 N. Avondale, Chicago 18, Illinois.

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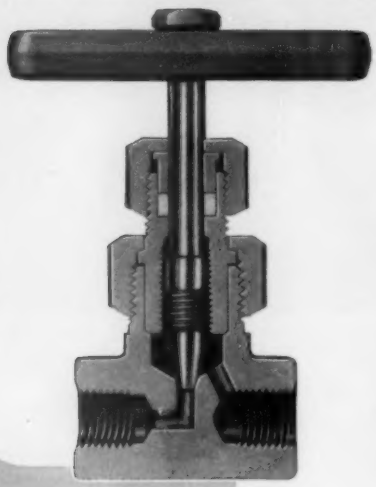

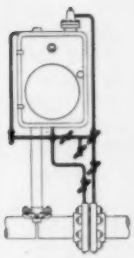

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Standard valves design rated for pressures to 5,000 psi at 70°F. For pressures to 10,000 psi, upon request, valves are hydrostatically tested and individually inspected. Valves are furnished with graphite-impregnated asbestos packing for temperatures above 450°F.

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under effective state laws while the American members of the international oil industry are operating beyond control of effective regulation on any level. Equality under the law at the point of production has been effectively overcome . . . the independent is being squeezed out—and the American consumer and America's security are suffering in the process."

Lester Clark, Breckenridge, Tex., independent, in a statement before a Senate subcommittee.

Defense and Oil

"Our freedom and our way of life depend on the degree to which we can assure increasing supplies of domestic energy at reasonable cost. For at least our lifetime, oil and gas will be the most important and useful forms of energy. . . .

"In a period when the United States is spending $40 billion annually on defense, it would be foolish to jeopardize the domestic supply of the energy most vital to that defense by unwise policies. There are many good reasons why national policies designed to encourage the development of domestic oil and gas resources should be maintained, but the most important reason is that these policies are essential to provide petroleum for our future progress."

Richard J. Gonzales, Humble Oil & Refining Co., director and treasurer, in a speech before the annual meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers.

What Senators Must Consider

". . . We must encourage exploration for oil, to bring in more reserves. But with the production costs mounting and returns on investment dropping, the search for new oil reserves slows down, too.

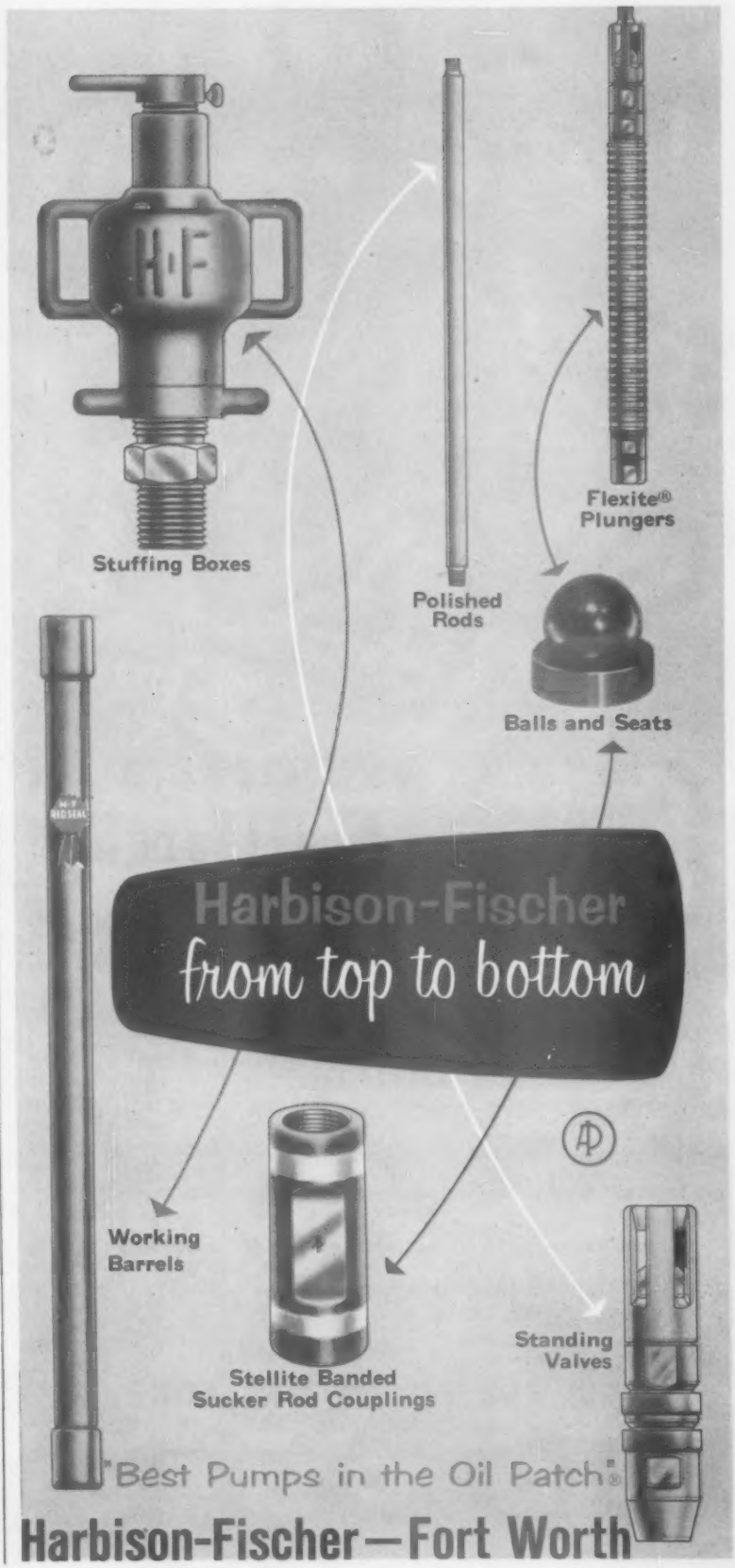
"The nation's economy and the nation's security can ill afford to allow adverse conditions to prevail in the oil industry. These thoughts, rather than the ballot box, should be foremost in the minds of investigating senators."

Editorial in the Houston Chronicle.

Trouble Heading for Oklahoma?

"We are at a loss to understand why Venezuelan oil hasn't been diverted to Europe instead of coming into the United States in increasing quantities. The flow of total imports into this country has not been reduced, nor have their effects on our economy.

"We in Oklahoma are more concerned at the present time with what is



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going to happen when this crisis is over.

"The St. Lawrence seaway is well on its way to completion. This means that cheap foreign crude will find its way into the Great Lakes area (Oklahoma's traditional market). If this seaway is completed before the Government takes action, one of the largest producing areas of this country will be stagnated in its future development."

Paul R. Schultz, president, Blackwell Oil & Gas Co., and Oklahoma Independent Petroleum Association, in testimony before a Senate subcommittee.

Sure Road to Oil Shortage

"Because of unrealistic crude prices and the growing unavailability of risk capital, domestic oil discoveries are failing to keep pace with anticipated future requirements, leading to dependence upon unreliable foreign sources. Smaller independents are being squeezed out of business, and even substantial operators are experiencing serious financial problems. To some extent, at least, the recent increase will alleviate a situation which clearly threatens the stability of our industry and relates directly to the economic and military strength of the country.

"We hope very much that crude purchasers will not again delay the posting of realistic crude prices as steel and other costs rise. The sure road to an oil shortage in America is to run out of independent oil men. We will do that only if we allow excessive imports and other conditions to deny realistic prices and adequate markets for domestic operators."

A. E. Herrman, president, Texas Independent Producers and Royalty Owners Association.

CALENDAR OF EVENTS

MARCH

18-21 American Society of Mechanical Engineers, national conference, gas-turbine power division, Sheraton-Cadillac Hotel, Detroit.

20-22 American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La.

25-27 Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.

25-29 American Society for Metals, Western Metal Exposition and Congress, Ambassador Hotel and Pan-Pacific Auditorium, Los Angeles.

27-29 American Power Conference, Sherman Hotel, Chicago.

30 North Texas Oil and Gas Association, twenty-seventh annual meeting, Kemp Hotel, Wichita Falls, Tex.

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APRIL

1-4 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, national convention, Kiel Auditorium, St. Louis.

2-4 Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.

7-10 Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.

7-12 American Chemical Society, national meeting, Miami, Fla.

8-10 American Society of Mechanical Engineers, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

9 American Institute of Chemical Engineers, Philadelphia - Wilmington section, University of Pennsylvania, conference on catalysis in practice, University Museum, Philadelphia.

9-11 American Welding Society, fifth annual welding show, Convention Hall, Philadelphia.

10-12 American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.

11 Illinois Oil and Gas Association, twelfth annual meeting, Mount Vernon, Ill.

11-12 West Texas Oil Lifting Short Course, Texas Technological College, Lubbock Tex.

11-13 Institute of Radio Engineers, ninth annual southwestern I.R.E. conference and electronics show, sponsored by Houston section, Shamrock Hilton, Houston.

11-13 Institute of Radio Engineers, second national simulation conference, sponsored by Professional Group on Electronic Computers, Shamrock Hilton Hotel, Houston.

11-13 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest Regional Conference, Portland, Ore.

16-18 Petroleum Industry Electrical Association annual meeting, Shamrock Hilton Hotel, Houston.

16-18 Petroleum Electric Suppliers Association, Shamrock Hilton Hotel, Houston.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.

18-19 Texas Petroleum Research Committee and Permian Basin Section of American Institute of Mining, Metallurgical, and Petroleum Engineers, tenth annual oil-recovery conference, Midland, Tex.

22-25 Canadian Institute of Mining and Metallurgy, annual general meeting, Chateau Laurier, Ottawa.

24-26 Natural Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

25-27 Appalachian Geological Society, Kentucky Geological Society, joint field conference, southeastern Kentucky.

25-27 American Association of Petroleum Landmen, third annual convention, Hilton Hotel, San Antonio, Tex.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference

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sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

1-3 American Petroleum Institute, Division of Production, eastern district meeting, William Penn Hotel, Pittsburgh.

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

9-10 Symposium on use of surface active agents in water flooding, Pennsylvania State University, department of petroleum and natural gas, State College, Pa.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

16-17 American Petroleum Institute, division of production, Pacific Coast district meeting, Hotel Biltmore, Los Angeles.

16-18 Geological Society of America, southeastern section, annual meeting, Morgantown, W. Va.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Petroleum Institute, division of transportation, central committee on transportation by water and tanker corrosion symposium, San Francisco.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

23-24 American Institute of Mining, Metallurgical, and Petroleum Engineers, third annual joint meeting, Rocky Mountain petroleum sections, Northern Hotel, Billings, Mont.

23-24 Western Petroleum Refiners Association, southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

29-31 Annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

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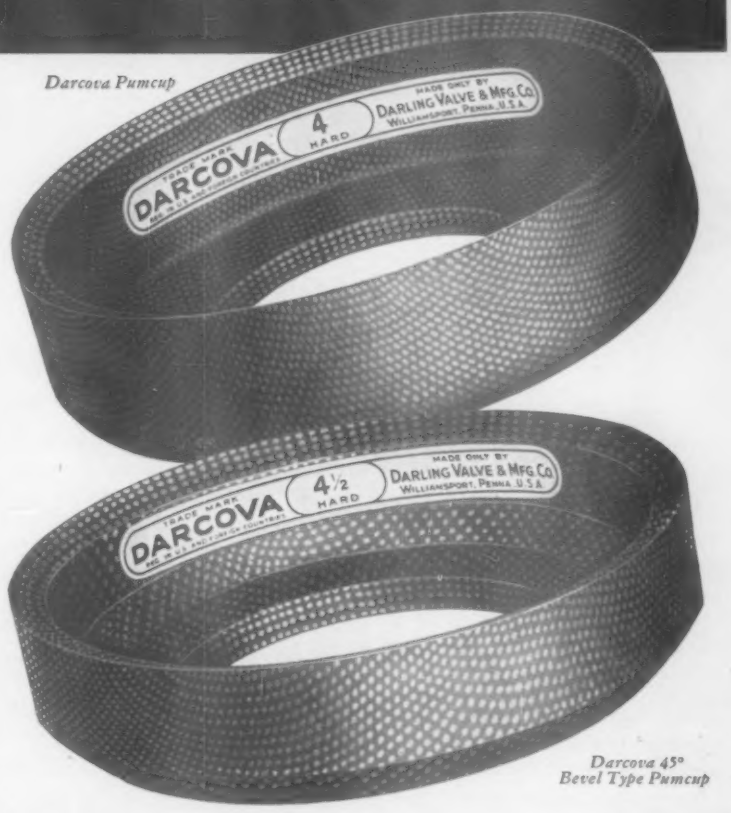

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PT-702

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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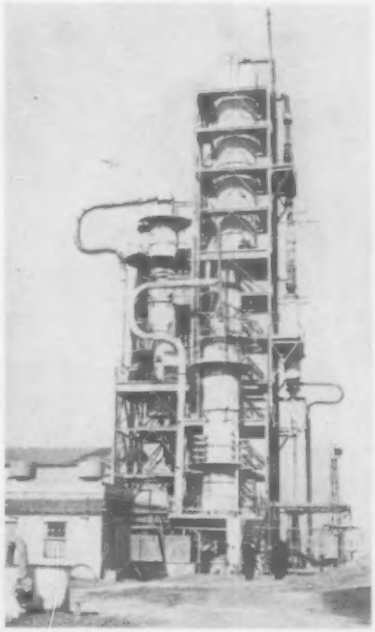

Russian Enigma

NOTICE anything new or unusual about this picture? You're not supposed to, apparently.

It came to us from Sovfoto, the official picture agency of the U.S.S.R., with no other information than the tantalizingly casual caption: "Photo shows a thermal installation for obtaining oil from oil-bearing sands."

Do the Russians have big deposits of oil sands? Do they have a commercial process for extracting the oil? Have they solved the riddle that the Canadians have been seeking for years of unlocking the vast reserves of the Athabasca tar sands?

If you can glean the answers from examining this picture, you're a better process detective than the Journal staff experts. We showed it to three of our refinery writers, and here are their comments:

George Weber: "The great depth of my experience in tar-sand extraction leads me to believe that the two towers, left and foreground, are fractionators and the upper vessel is the extractor, retort, or whatever. Is the moth-eaten vertical line at the right a lift-pipe? I think it might be. On the other hand, the whole business here might be the distillation section, with the heart of the unit in the shacks on the left. This apparently employs no centrifugation."

G. L. Farrar: "I am sure my experience is at least double Weber's on a process such as this. My guess is that the vessels shown comprise a fractionation battery. Equipment for removal of oil from the sand is probably in the building at the left."

John Reidel: "This damned thing looks like some kind of distillation. If so, they must be having a lot of fun with it inasmuch as we used to try distilling the crappy oil that comes out of the tar sands in Bureau of Mines Hempel distillation, and the foam was terrific."

All right, it's your turn to stump the experts. What's your guess as to this equipment and process? If you have a rational — or humorous — answer, we might print it.

As Winston Churchill said, "Russia is an enigma wrapped in a puzzle and shrouded in mystery."

Doodlebug Bugs

ON the subject of Russian mysteries, a geologist friend relays another piece of industrial intelligence that has just leaked out from behind the Iron Curtain. It seems that the Soviets claim to be able to find oil with microbes.

As we understand it, the Russians have discovered a kind of bacteria that lives in soil containing small amounts of petroleum hydrocarbons. Wherever a nest of these oil-eating germs is found, there is a pretty good chance that there is an oil or gas seep way down underneath somewhere. The report is that out of 20 favorable prospects located by the Russian microbiological method, 16 have been confirmed as oil fields by drilling.

Again we leave it to you. If the Ruskis can get oil out of tar sands with moth-eaten equipment such as that in the picture, maybe they can locate stratigraphic traps by studying germs. On the other hand, maybe it's just cold-war propaganda, bacteriological warfare division.

—*Henry D. Ralph.*

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is a **"MUST"**—you'll find

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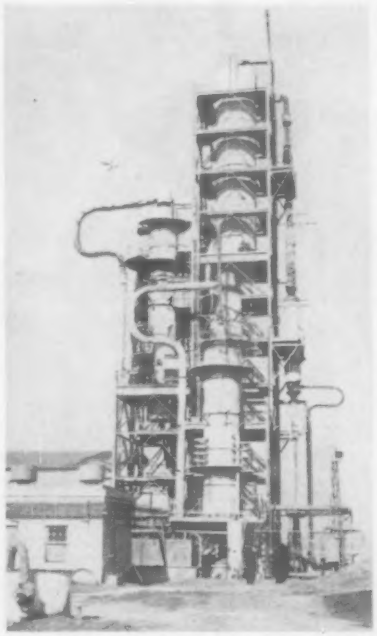
JOURNALLY SPEAKING . . .



Russian Enigma

NOTICE anything new or unusual about this picture? You're not supposed to, apparently.

It came to us from Sovfoto, the official picture agency of the U.S.S.R., with no other information than the tantalizingly casual caption: "Photo shows a thermal installation for obtaining oil from oil-bearing sands."

Do the Russians have big deposits of oil sands? Do they have a commercial process for extracting the oil? Have they solved the riddle that the Canadians have been seeking for years of unlocking the vast reserves of the Athabasca tar sands?

If you can glean the answers from examining this picture, you're a better process detective than the Journal staff experts. We showed it to three of our refinery writers, and here are their comments:

George Weber: "The great depth of my experience in tar-sand extraction leads me to believe that the two towers, left and foreground, are fractionators and the upper vessel is the extractor, retort, or whatever. Is the moth-eaten vertical line at the right a lift-pipe? I think it might be. On the other hand, the whole business here might be the distillation section, with the heart of the unit in the shacks on the left. This apparently employs no centrifugation."

G. L. Farrar: "I am sure my experience is at least double Weber's on a process such as this. My guess is that the vessels shown comprise a fractionation battery. Equipment for removal of oil from the sand is probably in the building at the left."

John Reidel: "This damned thing looks like some kind of distillation. If so, they must be having a lot of fun with it inasmuch as we used to try distilling the crappy oil that comes out of the tar sands in Bureau of Mines Hempel distillation, and the foam was terrific."

All right, it's your turn to stump the experts. What's your guess as to this equipment and process? If you have a rational — or humorous — answer, we might print it.

As Winston Churchill said, "Russia is an enigma wrapped in a puzzle and shrouded in mystery."

Doodlebug Bugs

ON the subject of Russian mysteries, a geologist friend relays another piece of industrial intelligence that has just leaked out from behind the Iron Curtain. It seems that the Soviets claim to be able to find oil with microbes.

As we understand it, the Russians have discovered a kind of bacteria that lives in soil containing small amounts of petroleum hydrocarbons. Wherever a nest of these oil-eating germs is found, there is a pretty good chance that there is an oil or gas seep way down underneath somewhere. The report is that out of 20 favorable prospects located by the Russian microbiological method, 16 have been confirmed as oil fields by drilling.

Again we leave it to you. If the Ruskis can get oil out of tar sands with moth-eaten equipment such as that in the picture, maybe they can locate stratigraphic traps by studying germs. On the other hand, maybe it's just cold-war propaganda, bacteriological warfare division.

—Henry D. Ralph.

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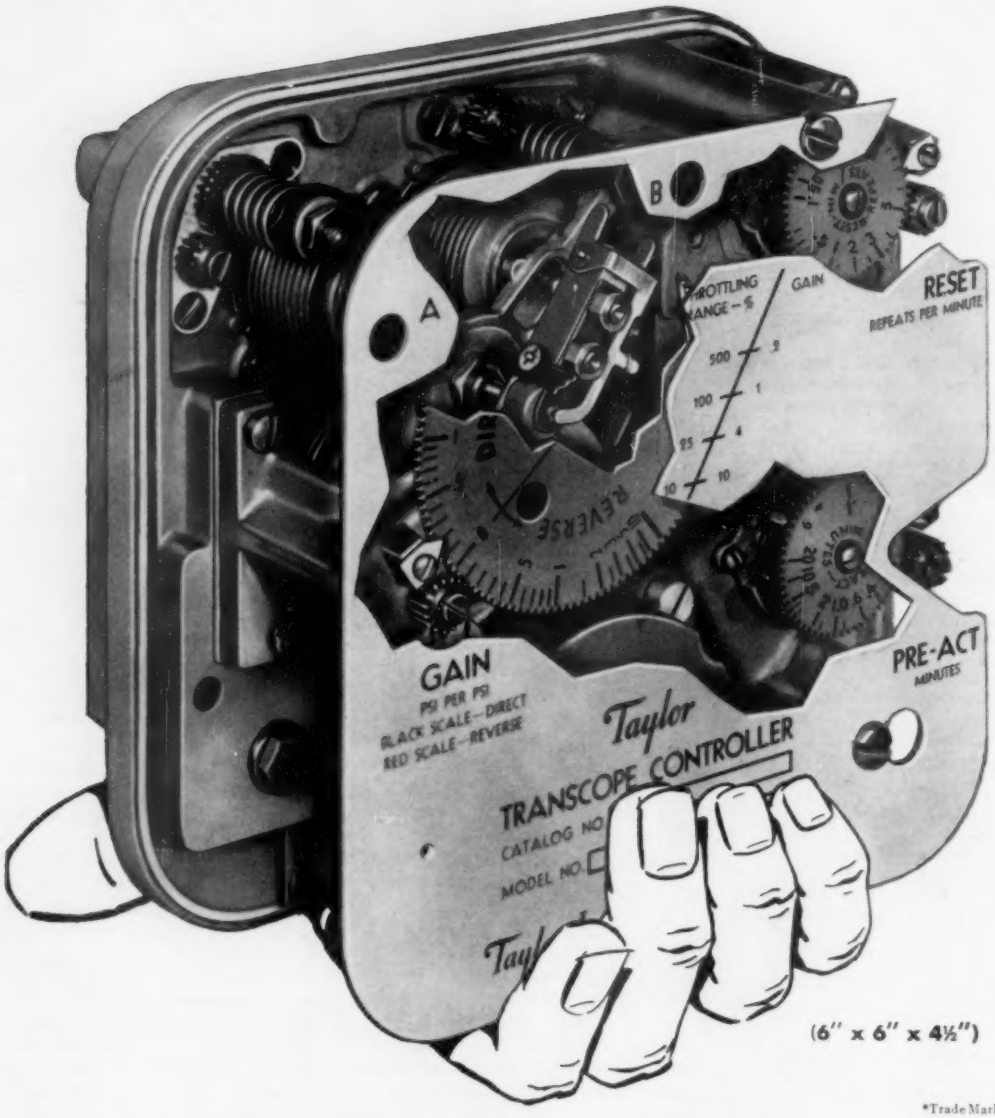

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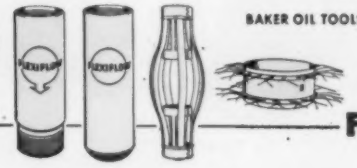

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How oil can hit back at its critics

THE oil industry seems to feel pretty good about the way its congressional critics piped down after three or four of its top spokesmen showed up in Washington with some facts about the European oil lift and the increase in prices.

But it shouldn't be complacent about it. Abuse of the oil industry may have dropped off the front pages, but it continues nevertheless. Sniping at business in general and oil in particular is the stock in trade of certain politicians and journalists.

It makes little difference that charges against the oil business are untrue. Their continual repetition builds a public suspicion that oil men are either highbinding conspirators or stupid bunglers, or both. New outbreaks of criticism and threats of punitive legislation may come at any time.

HOW TO HIT BACK at its critics is something the oil industry must learn if it is to stop being kicked around. The job is distasteful to most oil men. They are not skilled at it, and not organized to do it well.

Oil men are too prone to suffer in silence. They believe that truth and righteousness are on their side, but they have a frustration about demonstrating this to the public. Particularly they hesitate to stand up to their detractors and tell them off.

Abuse of oil will continue until the industry develops techniques for hitting back. It must hit back hard, promptly, and every time, until critics learn that they must be mighty sure of their facts before they can smear the industry and get away with it.

First, oil must marshal its facts and have them ready at all times for its defense—and, better yet, for a continuous offense. All too often a fire of public indignation has to be fought with hastily improvised equipment and volunteer firemen.

Second, the industry's top brass must be its spokesmen—spokesmen for the whole industry, not just their own companies or their own segments. The public can't get the whole picture clearly from statements by splinter groups, minorities, or little-known individuals.

A SAMPLE OF HOW oil can hit back is the special 16-page section in this issue of the Journal. It is a factual explanation of why oil prices went up. It was put together quickly by the Journal staff when it appeared that the industry was not speaking for itself.

There is nothing in these 16 pages that the oil industry doesn't know. But Congress and the public don't know it. If big-name, authoritative spokesmen had broadcast such information at the time of the increase there would have been no investigation and no recrimination.

The industry must be better prepared with facts to meet similar crises in the future. Inarticulate oil must find a voice.

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O.C.A.W.'s O. A. Knight. He's calling for strike votes, more pressure as . . .

Unions Team Up for Drive

OIL'S kaleidoscopic labor picture focused sharply for the first time last week.

What it revealed sent labor leaders scurrying to put teeth in demands for big wage increases in 1957. They sounded a hurried-up call for:

. . . **Concerted action** by smaller independent unions and the big Oil, Chemical, and Atomic Workers International Union.

. . . **Strike votes** by units with opened contracts.

. . . **More pressure** in negotiations with oil companies.

Labor was worried because the 6,300-member Independent Petroleum Workers of America accepted a 4 per cent (about 10½ cents an hour) wage increase from the Standard Oil Co. (Ind.) Whiting refinery.

This was the first agreement on wages in the oil industry this year and is way below union demands. The 105,000-member O.C.A.W. wants a 27-cent hourly increase, and the year-old Federation of Independent Oil Unions is asking for a 10 per cent (25 cents an hour) increase.

The I.P.W.A., which accepted the comparatively low 4 per cent, is affiliated with the 30,000-member Federation.

Reactions . . . When the agreement was announced, other unions showed how they felt about it:

. . . **O.C.A.W. President O. A. Knight** dispatched letters to all oil-industry bargaining units. He told them to support the demands, to take strike votes if contracts are open, and to put the pressure on oil companies during negotiations.

Knight warned that if oil companies do not make "reasonable" offers by the end of April, 90 per cent of the striking force could walk out under wage-reopening clauses.

The O.C.A.W. does not consider the Whiting negotiations a pattern for the rest of the industry.

"We have not changed our demands. Negotiations are continuing," he said, pointing out that similar offers were rejected by 4,000 members of the O.C.A.W. employed by Indiana Standard subsidiaries.

. . . **Central States Petroleum Union,** an independent association of 12,000 Indiana Standard employes, huddled with the powerful O.C.A.W. the day after the Whiting agreement. They met in Chicago "to talk over developments in bargaining and to compare notes."

There was little doubt among management, however, that the two groups explored concerted action in case of strike. Most Central States units have voted to strike if necessary, and many O.C.A.W. locals have done the same.

Central States sent a telegram to I.P.W.A. "vigorously protesting acceptance of the 4 per cent wage offer." Handbills, bearing Central States' name, were distributed at the Whiting refinery gate urging rejection of the offer as too small and a "gross injustice to all oil workers."

. . . **Other independent unions,** meeting in Washington, discussed cooperation with the O.C.A.W. on wage action. However, one group—the Federation of Independent Oil Unions—refused to take a position on the matter.

The Federation was organized last winter to keep independent groups from being swallowed up by the giant O.C.A.W.

The Whiting contract . . . The 4 per cent increase is effective until March 8, 1959, and is retroactive to February 1, 1957. The 2-year contract calls for a wage reopener next March.

It includes 4-week vacations after 20 years' service, instead of after 25 years, and an eighth paid holiday (Good Friday).

The I.P.W.A. members voted 1,627 to 7 for acceptance of the agreement, climaxing 3 weeks of daily bargaining between the union and management. Earlier in the year, Indiana Standard offered the workers a 3 per cent wage increase, which was rejected. This was the first wage offer made by management in 1957.

Sinclair . . . Until the recent developments, the Whiting negotiations had been in the shadow of more interesting negotiations between Sinclair Oil Corp., and the O.C.A.W. Since January, the oil industry had been watching Sinclair closely, because the contract with O.C.A.W. is the largest nation-wide contract in the industry, involving 15,000 employes.

The company at first refused to talk wages with O.C.A.W. This was in January. O.C.A.W.'s Knight then threw a strike threat into the picture *(The Oil and Gas Journal, February 11, page 68).* He said that if Sinclair wouldn't talk wages, the union would have no alternative to calling a strike.

Sinclair finally agreed to meet with O.C.A.W. in Kansas City earlier this month. The 27-cent union demand was rejected, and Sinclair made no counter proposals.

The conference ended the second day with no "ill feeling"—recessed indefinitely "subject to call by either party."

Holding the line . . . Other big companies—The Texas Co. and Shell Oil Co.—have also declined to make wage offers during talks with O.C.A.W., apparently feeling that the national hourly wage average of $2.59 to $2.69 is enough for the time being.

Last year's 6 per cent increase (15 cents per hour) had already spread through the industry early in March. This year—after 6 years of annual wage increases—the industry may be holding the line.

Middle East "Crisis" Looking Up

- **Here are latest developments: Iraq crude has reached the Mediterranean as result of temporary repairs to I.P.C. in Syria; Saudi Arabia has lifted its ban on crude moving to England and France; and clearing the Suez has moved into the last lap.**

- **In Washington, hearings will resume this week on the oil-lift program to Europe.**

TANKERS were standing by in the Eastern Mediterranean last week as the first Iraqi oil in 4½ months reached Banias.

The crude moved through the Iraq Petroleum Co.'s 30-in. line less than a week after the Syrian Government gave the company permission to begin repairs on the sabotaged system *(The Oil and Gas Journal, March 11, page 114)*.

While this and other key developments were unfolding in the Middle East, a Senate subcommittee prepared to resume its probe of the European oil lift with a possible "surprise" witness or two in the offing.

The inquiry was recessed over last week to give Sen. Estes Kefauver of Tennessee a chance to hold hearings on his bill to override the Supreme Court's "good faith" decision in the Standard Oil Co. (Ind.) case (see page 87). Kefauver has been taking an active part in the oil-lift hearings run by Sen. Joseph C. O'Mahoney.

The movement of Iraq oil was the first break in the impasse that has bottled up Middle East oil supplies since the beginning of November. The political questions involved in the Arab vs. Western World squabble are far from settled, but here's what else happened:

. . . **The 4-month ban** on Saudi Arabian oil shipments to England and France was lifted by the Saudi Government.

. . . **Saudi crude** was moving again to the 205,000-bbl. daily refinery at Bahrain.

. . . **Work was resumed** on clearing the last two sunken ships from the channel of the Suez Canal.

Pipeline repairs . . . A 20-man I.P.C. engineering crew headed by Chief Engineer Thomas Elliott got crude moving through the newer 30-in. line of the company's system with little difficulty. Work is still being done on the older 16-in. and 12-in. lines that terminate at Tripoli.

Three of the systems pump stations in Syria, T-2, T-3, and T-4, were damaged severely last November 2 after British, French, and Israeli forces invaded Egypt. The Syrian Government refused for months to even allow I.P.C. officials to inspect the damage. Then Syria withheld permission to begin repairs until Israel pulled out of Gaza and the Gulf of Aqaba.

I.P.C. officials say it will take months to replace the destroyed pumps at the stations. They plan to move about 220,000 bbl. daily through the system by using the T-1 station in Iraq and auxiliary pumping units.

The Saudi move . . . The Saudi Government lifted its ban on oil shipments to England and France very quietly and with little fanfare last week just a few days after the twin pipelines from Dammam to the Bahrain refinery were reopened.

Because Bahrain is a British Protectorate, the Saudis cut off the normal supply of about 185,000 bbl. daily that was being moved to the refinery of Bahrain Petroleum Co. (Standard Oil Co. of California and The Texas Co.) The 12-in. and 14-in. lines supplied the difference between the refinery's daily throughput and Bahrain's 30,000-bbl. daily production.

After the Bahrain lines were put to use again, allowing tanker shipments of Saudi crude to the British and French came as a matter of course.

The canal . . . The United Nations salvage fleet began last week to work on lifting the sunken tug, the Edgar Bonnet. The 130-ton tug lies squarely in the center of the canal.

The Egyptians halted salvage work on the vessel several weeks ago with the announcement that they had not yet removed explosives that were aboard the tug. Until last week, Egypt stalled.

The Egyptians still have not yet given Lt. Gen. Raymond Wheeler, in charge of the U.N. salvage team, permission to start work on the Abukir, an Egyptian frigate and the last obstacle in the canal. It, too, is reported to be mined.

Wheeler says he hopes to have the canal clearing job completed by April 10.

Senate probe . . . Appearing before O'Mahoney's subcommittee this week will be officials of Socony-Mobil Oil Co. and Arabian American Oil Co. Also to be heard is L. M. Glasco, president of West Coast Pipe Line Co., and possibly Paul Hadlick, counsel for the National Oil Markets Association.

The chance that surprise witnesses might be heard was raised in a disclosure that the subcommittee was considering the requests of "integrated interests" to testify. The interests, not named, reportedly are not members of the Middle East Emergency Committee.

Before recessing its hearings, the subcommitte was told that consumers will benefit from the recently increased oil prices "in the long run."

Jack H. Abernathy, president of the American Association of Oilwell Drilling Contractors, explained that the increased income to producers will enable them to improve drilling equipment. But the many oil probes now going on may affect producers' confidence in risking their money, he warned.

High taxes rather than high gasoline costs are at the root of consumer resentment over prices, according to Reid Brazell, president of Leonard Refineries, Inc.

Speaking as president of the Western Petroleum Refiners Association, Brazell said that while his refinery price last month was only 3.8 per cent higher than in July 1953, the federal tax has increased 50 per cent in the same period and the Michigan state tax has risen one-third and, in addition, there is a 3 per cent sales tax.

"We, as a refiner, are receiving an average of 14.12 cents per gallon for our gasoline and the taxes are 9.9 cents per gallon," Brazell said. "I think you would agree with me that the price of gasoline is not high, it's the taxes.

"And incidentally, I didn't see any reports from the press of an investigation by Congress when the taxes were increased, asking for a roll back in taxes," he added.

Brazell objects to congressional proposals that the major companies absorb the crude-price increase and roll back the price of gasoline. It would put the independent refiners out of business, he declared.

Other pipeline developments . . . The

premier of Jordan said that he would welcome any move of I.P.C. to make use of the two pipelines crossing his country that have been idle since 1948.

The premier, Suleiman Nabulsi, said any such proposal would get a cordial reception from his government. He made one condition—the lines would have to be diverted from Israel to some point on the coast of Lebanon.

One line, 12-in., was broken by the Arabs when Israel was created in 1948. It supplied the 75,000-bbl.-daily Haifa refinery. The other, 16-in., was built only to the Israeli border. It has never been used.

Outside the troubled political area of the Middle East another pipeline proposal is apparently about to become a reality.

Kuwait will begin talks this week with I.P.C. about a new pipeline from the Basrah fields in southern Iraq to a Persian Gulf loading port near Mina al Ahmadi in Kuwait.

The only loading port for tankers that can serve these fields is at Fao at the head of the Persian Gulf. Tankers have to cross a shallow bar to reach Fao. This has limited the shipping traffic to small tankers and has placed strict limitations on the amount of southern Iraq oil production.

Sen. Kefauver's committee listens as . . .

Oil Speaks Up at S-11 Hearing

WASHINGTON. — The oil industry wasted no time in defending itself when hearings on the S-11 bill got under way last week. More than 250 persons, companies, and trade associations asked to be heard.

Spokesmen for major oil companies told a Senate judiciary subcommittee that bills placing limits on the "good faith" defense could wipe out competitive pricing.

They testified before Sen. Estes Kefauver of Tennessee, chairman of the antimonopoly subcommittee and author of a bill to override the Supreme Court decision in the Standard Oil Co. (Ind.) "Detroit case." That decision held that to offer lower prices to selected customers to meet competition in good faith was not in violation of the price discrimination ban in the Robinson-Patman Act.

Kefauver's proposed amendment to S-11 would limit the good-faith defense to cases where it can be shown that the lower prices do not tend to lessen competition or create a monopoly.

An amended version of S-11 passed the House last year 393 to 3, but Congress adjourned before the Senate acted.

What witnesses said . . . They warned that the unclear language of the bill would result in the issue being before the courts for years.

Rep. R. D. Harrison of Nebraska, a Sinclair jobber in Norfolk, Neb., said "now I know what it feels like to sign your own death warrant without even realizing that you're doing it" in explaining a reversal of his stand on S-11. He was among those who voted for the measure in the House last year.

Details on the much-publicized "secret" meeting in Chicago last fall were revealed by J. G. Jordan, sales vice president for Shell Oil Co. He was the first industry witness.

Jordan said he called the meeting, attended by 60 or 65 oil men, on his own initiative, and that it led to so much confusion that nothing of an organized character came of it.

He said he was told last September by the counsel and president of the National Oil Jobbers Counsel that, as marketing vice president of the A.P.I., he should see to it that jobbers and dealers are informed on pending legislation.

Since this was outside the scope of A.P.I. activities, Jordan said he undertook to start something on his own initiative.

The meeting was held in the University Club, New York City, and attended by about 20 persons. They decided a broader group should be called, so 65 were invited to Chicago. It was narrowed to a 9-man steering committee which still couldn't agree, Jordan said.

The bill as drawn now "will be a very large step toward fixed-price rigidity which in the end will tend to eliminate competitive pricing in the free market," Jordan told the subcommittee.

He recommended that since the majority of the country's gasoline retailers are not represented by associations that the subcommittee "make some arrangement to ascertain the views of this great majority who have not been heard from."

Jordan and D. A. Hugill, Shell attorney, suggested an amendment to eliminate some of the ambiguity of S-11. They recommended deleting the phrase "substantially to lessen competition" or defining it in plain language.

Dwight F. Benton, Indiana Standard's sales vice president, refuted the accusation that oil companies have conspired to "force gasoline dealers and jobbers to oppose a bill."

"We did not conspire with anyone to do anything. We did talk about S-11 with other oil companies. We did talk with many of our dealers. We are certain we had not just a right but a duty to do both things. And we resent any attempt to intimidate us by the suggestion that there was something wrong with our activities."

Benton said dealers are now opposing S-11 because they have found "it is a threat to their very existence." He criticized the support given by National Congress of Petroleum Retailers which, he said, is "not national, not a congress, and not representative of petroleum retailers."

Benton also referred to the Chicago meeting, out of which came "no concrete action of any kind."

"We couldn't get the individualistic companies of our industry to cooperate long enough to get a plan of action," he said.

Gas injection may solve . . .

. . . Anahuac's Odd Problem

AUSTIN.—Operators in prolific Anahuac field on the Texas Gulf Coast have an unusual problem.

The big Chambers County field has a natural water drive which is almost too strong.

In its 22 years so far Anahuac has produced roughly 125,000,000 bbl. of oil from its Frio and Marginulina pays. Surprisingly, despite this whopping output, Anahuac bottom-hole pressure is climbing. The field has produced 18,000,000 bbl. since 1953—and pressure in that time has gained 15 psi.

This means, of course, that water is coming into the reservoir faster than the operators can produce it and the allowable oil. The situation poses a threat in that oil is being forced up into the pool's gas cap where almost a third of it can never be recovered.

To counter this danger, Anahuac operators, led by Humble Oil & Refining Co., have asked the Texas Railroad Commission to approve gas injection into the gas cap. This would build and hold pressure in the cap and prevent it from shrinking more.

Along with the gas-injection permit, Humble seeks:

. . . An MER boost from the present 28,500 bbl. daily to the original 32,000 bbl. per day figure. Also a hike in the per-well top of 100 bbl. daily to 122 bbl. daily for a well on 20-acre spacing.

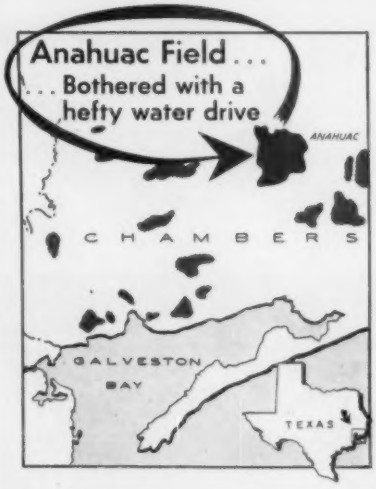
. . . A net gas-oil ratio rule giving allowable credits for returning gas to the producing zones.

Gas would be injected through two input wells into the Frio A, the field's main pay. This pay has produced about 117,000,000 bbl. of the oil so far.

The Frio A produces just below 7,000 ft. Its oil zone is about 125 ft. thick. It is one of 12 Frio zones in Anahuac. All are separated by shale breaks. All but the top member, the Frio 1, are thought to benefit from the water drive. Humble estimates that there is about 450 ft. of productive Frio pay in the field. The Frio and shallower Marginulina zones were discovered in March 1935, atop a deep-seated salt dome.

Humble operates 271 of the 332 wells in the field. Only 21 of these are producing from the Marginulina.

The field's pressure performance has been remarkable. As of the last survey, it had fallen only 225 psi. (or 7 per cent) in 22 years from the original 3,230 psi.



Loss could be heavy . . . The recent hike in pressure and a climb in gas-oil ratio in the Frio A to 942:1 have proved to Humble that the gas cap is shrinking.

Clark F. Sharp, Jr., Humble engineer, told the commission earlier this month that company studies show that Anahuac operators will lose about 0.29 bbl. as residual saturation for every barrel of oil that enters the gas cap.

Humble and other operators, Sharp said, have been producing water heavily to slow cap shrinkage but haven't been able to halt it. Salt-water production is running about 65 per cent of total field output now.

He said studies have shown that coning and fingering isn't taking place in the field as Humble thought 10 years ago. (The field MER was cut to 30,000 bbl. in 1946 on Humble's recommendation.)

Humble thinks that Anahuac will be 90 per cent depleted in another 20 years if the higher MER is approved. And the reservoir would still boast 85 per cent of its original pressure. At this level, pressure would be 163 psi. above the equilibrium gas-saturation pressure.

Under the higher MER, water would advance into the reservoir at a rate of only 50 ft. a year, Sharp said. Humble figures reservoir pressure would continue to go up since total voidage with gas injection would be less.

Other operators . . . Other operators in the field generally lined up with Humble.

Gulf Oil Corp. said it didn't object to the gas-injection program or to the MER hike, but wants a per-well limit of 150 bbl. per day, which is higher than Humble's request. It also asked that the net gas-oil ratio credit be limited to Segment A.

Sun Oil Co. urged the commission to approve the higher MER. The company said it was ready to deliver gas to Humble for injection.

Exhibits showed that 99 per cent of Anahuac royalty owners have approved the gas-injection program.

Florida Line Clears Tracks

WASHINGTON.—The last barrier to the $148.8-million Texas-to-Florida natural-gas pipeline has been leveled.

F. E. Stanley, president of Houston Texas Gas & Oil Corp. announced here last week that the two major Florida utility customers have agreed to accept all rate conditions laid down by the Federal Power Commission.

Houston Texas Gas & Oil and Coastal Transmission Corp., which between them will build a 1,517-mile system from the lower Rio Grande Valley to south Florida, can now complete arrangements for building, Stanley said. The system will also include over 1,000 miles of gathering lines.

Construction is scheduled to begin this summer. First gas is due to flow through the line in 1958.

Stanley said Florida Power & Light Co. and Florida Power Corp. have agreed to the FPC's requirements that any rate change will be subject to its approval and that rate schedules cannot be canceled because of any FPC-approved change.

Hard-Luck Wildcat Inches On

PECOS, Tex.—Gulf Oil Corp. was grinding away on extremely hard chert at 18,604 ft. last week in its 1 P. G. Northrup, holder of the drilling depth record for the Permian basin.

Making only 1 to 2 ft. a day with diamond bits, the Reeves County deep test was trying to get back hole it lost last December when a fishing job forced it to retreat to 18,061 and sidetrack.

It had reached 18,771 ft. to set the basin record when the fishing job occurred. The wildcat has a projected total depth of 19,200 ft. where Gulf hopes to take a look at the Siluro-Devonian.

Gulf has been drilling this hard-luck deep test off and on since January 13, 1952. It has had a heavy-duty rig on the project for about 880 days. In the 5 years since the hole was spudded, the well has been abandoned temporarily and reentered three times. The hole has been sidetracked three times, too.

HINES H. BAKER
. . . resigning as Humble's president.

MORGAN J. DAVIS
. . . logical successor as president.

Davis in Line for Humble's Top Spot

HOUSTON. — Hines H. Baker, 63, will retire as president and director of Humble Oil & Refining Co. April 29.

Morgan J. Davis, executive vice president and a director, is his likely successor.

In announcing Baker's plans to retire, Humble revealed he has agreed to be nominated for the board of directors of Standard Oil Co. (N.J.). Jersey Standard, which holds about 88 per cent of Humble's voting stock, has scheduled its annual board meeting May 22.

Baker has been president of the nation's largest domestic oil producing company since May 1948. He has been an employe of the firm more than 37 years and has been a director since 1937.

Notice of Baker's planned retirement was sent to Humble stockholders last week. The announcement stated:

"He assigned as a principal reason for his decision a desire to enable thoroughly competent younger men in present executive positions to advance and assume larger responsibilities, and thus to make possible longer service by them in the higher executive positions with enough time before them to develop and carry forward their plans for the company's further progress."

The notice also included a proposal by the board of directors of a two-for-one split in Humble stock. The authorized number of shares would be increased from 38,000,000 to 76,000,000.

Directors have indicated that they plan to elect Davis to the presidency. Davis was elected to the board in 1948. He became vice president in 1951 and executive vice president last May *(The Oil and Gas Journal, May 21, 1956, page 313).*

Growing staff still 3 years behind:

Gas Regulation Getting Costly

WASHINGTON.—Federal regulation of independent gas producers is an expensive job. And the cost is rising.

The cost for staff alone in the first year after the Supreme Court decision in the Phillips case in 1954 was $507,000. In fiscal 1956 the cost was $681,000. This year the cost will hit $900,000 on the basis of the $623,500 paid in salaries for the first 8 months.

It will take another 3 years for the FPC to get abreast of its work, Chairman Jerome K. Kuykendall told a House appropriations subcommittee.

Kuykendall disclosed that the FPC asked some $600,000 more than the $5,900,000 carried in the budget. The Budget Bureau cut the money out because it felt the FPC couldn't find as many qualified people as it wanted to hire, he said.

Some were bitter . . . The subcommittee held its closed-door hearings in February. The transcript, just made public, shows that committee members from producing states were bitter about producer regulation.

At times they ganged up to attack control. Here's an example:

Chairman Thomas (Texas): "On certificates of convenience and necessity—there ought not to be any such animal for a gas well. . . .

"Take the coal fellows of Illinois. When they have a carload of coal to go to Texas, do they have to go to the FPC and get a certificate of convenience and necessity and prove a case? Do they have to show that these poor downtrodden people in Texas need that coal?"

Kuykendall: "No, they do not need to come to us."

Rep. Yates (Illinois): "Do they burn any coal in Texas?"

Rep. Jones (North Carolina): "And what about lumber and wheat?"

Thomas: "Or cotton or anything else?"

Yates: "Or mica?"

Thomas: "They are all agricultural commodities and they come out of the ground."

Gas might get scarce . . . Pressed by subcommittee members on the question of price increases for producers, Kuykendall said the FPC could "perhaps" keep the price down.

"But we could make it so scarce that there would not be enough to go around and that is not our intention," he said. "Our intention is to fix prices that would be fair and give the producer an incentive to explore and develop."

And prices too low would "tend to prevent the consumer from having the gas that he would be glad to have and it would also weaken the power potential and the economy of the country as well," Rep. Vursell (Illinois) commented.

The Supreme Court decision "embarrassed and fettered and inhibited" the FPC, Vursell said.

Alaskan Test Faces Delay

ANCHORAGE.—Richfield Oil Corp.'s first test on the 71,680-acre Swanson River Unit on Kenai Peninsula will probably be delayed until mid-May or early June.

Originally slated to get under way February 7, the test was postponed to March 1. Now Richfield is racing the spring thaw, with the odds appearing to favor the thaw. If the thaw sets in before the rig can get to the site, then operations will be delayed 6 weeks to 2 months.

The key to the whole operation is the recently completed 20-mile road from Naptowne to the drill site. The rig, under contract with Coastal Drilling Co. of Bakersfield, Calif., was scheduled to leave Long Beach harbor for Alaska last week.

WELLS ARE JACKED UP 20 ft. in sinking area near Pier A in Long Beach harbor, new foundations are poured, and dirt fill brought in. Nine wells in foreground have received this treatment. Others will get it as . . .

Subsidence Slows Down

● But engineers continue double battle to keep the ocean from moving in; they still plan huge water-flood project

LONG BEACH, Calif. — This city's battle against subsidence in the harbor area continues. But evidence is beginning to show up that the rate of sinking is slowing down.

In 1952, the yearly rate of subsidence at the center of the affected area was 2.2 ft. As of last August, the rate had dropped to 1.4 ft. per year. Similar declines are recorded in all parts of the 22-sq.-mile subsidence area.

However, rather than slow down the fight against subsidence, engineers are stepping up their operations. Currently, work is either being done, or planned, on two fronts:

. . . **Petroleum engineers** are awaiting state approval of a huge water-flood program. This 180,000-bbl. daily project, designed to combat subsidence as well as increase crude recovery, will be a forerunner of a much larger program.

. . . **Civil engineers** are in the midst of a multimillion dollar project of filling in subsiding areas and raising structures to presubsidence levels.

Remedial work . . . Huge earth-moving machines are constantly at work filling in areas while, simultaneously, petroleum production men are at work raising wellheads. In many cases this involves raising surfaces as much as 25 ft.

At the approach to Pier A the subsided area is being raised an average of 25 ft. (see photo). This land is now only 2 or 3 ft. above low low-water. This puts it several feet below sea level during 7½-ft. high tides. Dikes are now holding back the ocean.

Work will begin in several weeks on an 800,000-yd. fill at the approach to the west side of the Ocean Boulevard bridge. A 25-ft. raise is planned for this area, which has subsided about 20 ft. About two dozen wells will be affected.

Before summer, the huge sheds on berths 1 and 2 on Pier A will be raised to 25 ft. above low low-water. They are now only 4 ft. above, making them below sea level at high tide. It will cost $860,000 to raise the wharf, $970,000 to raise transit sheds, and $660,000 to raise the area back of the berth.

The same type of work is planned for berths 3, 4, and 5 on Pier A at similar costs.

At last reports, more than 17,000,000 cu. ft. of earth had been hauled in to the sinking area.

Long Beach Development Co., operator for the city on its portion of Wilmington field, has raised 284 wells with 53 to go under present program. The average cost per well on this work has been $8,000. In several cases the operator has abandoned wells where it was deemed unprofitable to raise them.

Not only has the Harbor Department had to raise its wharves and build dikes, and the oil company raise its production equipment, but both are now planning to move their offices to higher ground. Their present buildings are behind the dikes in an area 20-ft. below sea level several hundred yards from the ocean. Their new offices will be built on Pier A on a site which will be raised 5 ft. before building begins.

Big water flood . . . Engineers are guardedly optimistic that a large water flood might halt subsidence.

The recently announced 180,000-bbl. daily flood is designed primarily as a secondary-recovery measure. But the city admits it will be watched closely for any effects on subsidence.

It is almost unanimously conceded that subsidence is directly related to crude production from the Wilmington field. Engineers point to production from the Tar, Ranger, and Terminal zones as resulting in subsidence over the 22-mile area which is more than 22 ft. deep at its center. Total oil production from the three zones exceeds 650,000,000 bbl.

Long Beach Oil Development, with the city's approval, has submitted a plan to the state for the 180,000-bbl. flood on the south flank of the field. The plan is now being studied by the State Lands Commission, which must approve it before it can be started.

Some engineers have estimated a flood of 1,000,000 bbl. daily would be necessary to effectively halt subsidence. Even if such a flood were started today, it would be 3 years before the void spaces already created would be filled.

A pilot flood of 15,000 bbl. daily has been in operation for 3½ years in the Upper Terminal in Block 5-B. This flood has demonstrated excellent secondary-recovery results. But it is too small to give any indication of halting subsidence.

There are several other small pilot floods in the field but none of sufficient size to offer any information on flooding as a subsidence abatement measure.

The city is pushing a bill at the current session of the state legislature which would permit it to enter in voluntary unitization agreements with pri-

vate operators. Unitization of a major part of the field would be necessary before any record size flood could be started.

Other problems . . . Subsidence has resulted in several other frustrating problems to the city of Long Beach.

The entire offshore area between Rainbow Pier (which roughly marks the present southeast productive limits of Wilmington field) and Monterey Oil Co.'s successful offshore operation at Seal Beach 4½ miles to the south is one of the most attractive unexplored places in the state. Production offshore from Seal Beach is from Wilmington anticline, the same as at Wilmington field 4½ miles away.

But the threat of subsidence has forced the city to shelve any plans for developing this acreage.

If production were started on this acreage, and subsidence set in as at the harbor, the destruction to onshore properties would be tremendous. The 4½ miles between Seal Beach and the south edge of the Wilmington field lies seaward from metropolitan and downtown Long Beach.

This area is already beginning to feel the effects of subsidence from harbor area production of the Wilmington field. Engineers predict that development of the 46-mile stretch of submerged lands would result in an 8 to 10-ft. subsidence in downtown Long Beach.

The city is firmy committed to a policy of not doing anything about this area until every safeguard has been taken to insure that a repressuring program would start as soon as possible after production commenced.

Subsidence in downtown Long Beach recently contributed to a unique situation where a proposed new civic building was designed with a built-in lean. The idea was that subsidence would eventually straighten it up.

Oil-Marketing Hearings Set

WASHINGTON.—Another congressional probe of the oil industry will get under way next month.

Rep. James Roosevelt of California, chairman of a House small-business subcommittee, plans hearings on a series of bills based on complaints of marketers against their oil suppliers. These include a bill to divorce retail marketing and another to provide redress for service station operators whose leases are canceled.

The subcommittee will hold hearings in Washington and then tour the country, Roosevelt said. It is considering hearings in Los Angeles, Houston, St. Louis, Cleveland, and Chicago.

watching WASHINGTON

. . . with Bertram F. Linz

Gas bills need Ike . . .

A NEW gas bill may be offered Congress pretty soon. But what happens after that is still a question.

Democratic leaders who fought for the bill last time are ready to fight again. But they aren't going to start the fight. That, they say, must be done by the White House.

Unless the President comes out strongly for a bill exempting independent producers from Federal Power Commission, it may just gather dust. The top Democrats haven't said just how strong that appeal must be if they are to move. But they have indicated it will have to be pretty definite to protect them against the attacks of newspapers and politicians championing the cause of the consumers.

This feeling is not confined to the exemption bill. It extends to all gas legislation. The FPC urged a number of changes in the Natural Gas Act in its annual report. Rep. Oren Harris of Arkansas, chairman of the House commerce committee, told FPC Chairman Jerome K. Kuykendall that if these changes were put in the shape of a bill he would introduce it "by request." Putting a bill in that way doesn't commit any one to support it.

So the White House is the spot to watch. What, if anything, the President says beyond his previous comments that the bill is needed, will go a long way toward determining the gas producers' future.

Defense line gains points . . .

A RECENT ODM order may be the tip-off that the Government is ready to back a Gulf-East Coast oil pipeline.

Mobilizer Flemming has ruled that quick tax writeoff may be given on "strategically located" pipelines needed to fill "a special wartime requirement." Only the East Coast line falls into that class at the moment.

The line has been on the military's "urgent" list for some years. But the Government has been reluctant to underwrite a project that might or might not pay off in peacetime. The blow-up in the Middle East, however, showed what we might be up against in the event of war.

Two offers for a line have been held in ODM files for several years. Texas Eastern Transmission Corp. would make the present Little Inch gas line, if allowed to convert it, the base for a through line if an emergency arose. American Pipeline Corp. wants to build a products line all the way, which could be quickly converted.

As insurance, the military would prefer a line built and ready to go if and when needed. They know from Big Inch experience that it takes time to lay pipe. And time may be the most precious commodity come another war. That fact may lead the Government to look more favorably on a loan to get a line built.

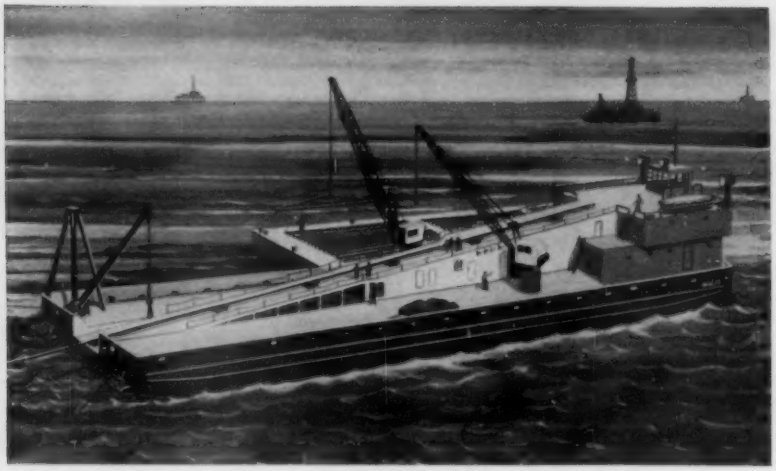
Farm bloc eyes rubber-plant lab . . .

THE Government has made several tries at selling its big alcohol-butadiene plant at Louisville. Now Congress may decide, after all, not to sell this last piece of the wartime synthetic-rubber industry.

Unable to make a deal that would keep the plant in butadiene production, the Federal Facilities Corp. is backing a bill for its sale for any purpose just to get rid of it. But farm-bloc senators have another idea.

This group is back of a big research program to use surplus crops for industrial products. A presidential commission is now studying that program. It is to make a report by June 15 and is likely to list synthetic rubber as a likely use. In that case, the Louisville plant would make a ready-to-go laboratory.

Pressure is being exerted to sidetrack the bill for at least 3 months and it is likely to succeed. Since the plant will bring in something less than the $6,000,000 at which it is now valued and is under a lease that still has a year to run, there's no hurry to sell, anyway.



Here's an artist's sketch of Marine Gathering's new . . .

Offshore Pipe-Laying Barge

HOUSTON.—Marine Gathering Co., which pioneered in operation of submarine pipelines, soon will go into the offshore pipeline construction business.

The firm's $750,000 pipelaying barge, the "Magic," will be commissioned at Greens Bayou near Houston March 20.

Marine Gathering is a wholly owned subsidiary of Commonwealth Oil Co. For several years it has operated an underwater pipeline system which gathers gas from Rollover field off the coast of Louisiana and delivers it to onshore trunk lines.

G. Burton Liese, Commonwealth president, said the new barge will go to work soon after the commissioning. Details of its first job have not been announced.

How it works . . . The barge is designed for laying 2,000 ft. of large-diameter pipe or 5,000 ft. of small pipe in 24 hours. It will carry 46 men. These will include two pipeline crews besides barge personnel.

Pipe will be fed into the gulf from a ramp mounted on the barge. After being welded and waterproofed, the pipe will ride down the ramp on revolving automobile tires.

The barge will be towed to the construction site. From there it will work itself along the pipeline route in "bootstrap" fashion by means of anchors dropped from the four corners of the vessel. A tug will place the anchors in front of and behind the barge. It also will relocate the anchors as necessary.

Pipe will be precoated and covered with a heavy sheath of mesh-reinforced concrete. It will be lifted onto the barge one section at a time from a smaller supply barge tied alongside the "Magic."

Work will progress simultaneously at five stations along the ramp.

As a new section of pipe is hoisted into place at the top of the ramp it will be welded with a stringer bead. This process requires about 6 to 8 minutes.

After this step the barge will move forward 40 ft., the length of one joint. The hot pass then will be applied while the cycle begins again at the top of the ramp. Two welder-helper teams will be at the third station. One will apply the filler weld, and the other will put on the cap weld.

The fourth station is for X-ray inspection. An X-ray photo of the joint can be rushed to the laboratory under the ramp for developing while the joint is being wrapped with polyvinyl tape.

At the fifth station the joint will be covered with a flexible form, and concrete will be applied even with that on the adjoining pipe.

With announcement of its pipelaying venture, Commonwealth pointed out that production of oil and gas in the Gulf of Mexico is increasing rapidly. The new barge, the company added, "symbolizes the development of another giant industry . . ."

First of its kind . . . Liese said the "Magic" is the first vessel specifically designed and built for laying pipelines under the open gulf.

Specifications for the vessel were drawn by Robert C. Ledford, vice president of Marine Gathering. He supervised laying of the company's existing line, which was the first underwater gas line in the gulf.

L. E. Davis is superintendent of construction and operations for Marine Gathering, and M. I. McGowan is chief engineer.

Design of the barge was carried out by Christensen & Graham, marine architects of Pasadena, Tex. The vessel was built at the Marine Fabricating & Engineering Co. shipyard at Greens Bayou.

Gas Lines May Face New Tax

AUSTIN.—The so-called gas-reserves dedication tax is back again in Texas.

A bill providing such a tax has been introduced in the Texas Legislature by Rep. Tom Joseph of Waco. The amount would be 0.75 cent per M.c.f.

The tax would apply to "beneficial users" of the gas—or the pipelines.

Earlier this year *(The Oil and Gas Journal, February 11, page 80)* Gov. Price Daniel said he would recommend such a tax if it became apparent that Texas needed more revenue.

He has not as yet made this recommendation. However, his administrative assistant, George Christian, observed last week that the Joseph bill "appears to contain" Daniel's tax plan.

Daniel in February said that gas-reserves dedication contracts "are tying up gas reserves in Texas . . . for as long as 20 years or more."

"At least half the reserves are being committed to out-of-state users. Such contracts and the privilege of withdrawal thereunder are valuable rights and properly taxable by the state."

The governor estimated state income from such a tax at more than $35,000,000 for the next 2 fiscal years.

The Joseph bill provides that no one should be taxed twice on the same gas. If a firm or individual paying the state's production tax on gas were required to pay the dedication tax on the same gas, he could credit it against the dedication tax.

Producer tax hike? . . . Another gas tax, this one aimed squarely at the producer, would raise his tax from 7 to 9 per cent of value at the wellhead.

The bill, introduced by Rep. L. C. Terrell of DeKalb, would exempt that gas reinjected (unless sold for that purpose), vented or flared lawfully, or used for lifting oil.

The Texas gas production tax reached as high as 9 per cent once before in 1954. The legislature raised it to that level from 5.72 per cent in an emergency session called early that year to meet revenue needs.

The whopping increase was made a bit more palatable to producers, however, in that it was to decline to 8 per cent on September 1, 1955, and to 7 per cent on September 1, 1956. The theory was that climbing gas production would more than make up the loss to the state from these tax cuts.

Producers were threatened with cancellation of this cut at the legislature's last session. Now the threat to reraise the tax has come up.

Other bills . . . The state senate, meanwhile, has passed two bills making minor changes in the laws dealing with oil and gas leasing on University of Texas lands.

One permits the geological costs to be charged against the 1 per cent bidders' fees. The other amends the law governing sales of University leases to make sales notices conform to those required on sales of public school lands.

Deep Gas Test Set

Tidewater to final high-pressure Louisiana well

CROWLEY, La.—Tidewater Oil Co. has set casing through a deep gas sand which operators previously had shied away from because of its extremely high pressures.

After drilling through the high-pressure 14,500-ft. zone, the company announced plans to deepen the hole "to look at some more sands."

The well, 1 H. Thibodeaux, is about 2 miles south of Church Point, in Acadia Parish, Louisiana. It is 1,500 ft. southeast of Tidewater's 1 Daigle, which was plugged back 2 years ago after hitting the gas and distillate sand where bottom-hole pressure was estimated at more than 13,000 psi.

Tidewater and associates spudded the new well last fall with the intention of seeking the same sand *(The Oil and Gas Journal, October 29, 1956, page 68)*. Completion in the high-pressure zone is considered feasible now because of recent advances in equipment and increased know-how in drilling deep wells.

The company set 7-in. casing about 104 ft. below the primary target. Testing of the zone is expected to begin in about 10 days.

Associated with Tidewater in the costly venture are Gulf Oil Corp., Amerada Petroleum Corp., and Petroleum Reserves, Inc.

Texas Gas Production Climbs

AUSTIN.—Texas gas output topped 6 trillion cubic feet for the first time last year to set an all-time record.

The Texas Railroad Commission reported last week that 1956 production in the state totaled 6.005 trillion cubic feet. This was a gain of 4 per cent over the 5.74 trillion cubic feet produced in 1955.

The commission said 4.725 trillion cubic feet of the total was "marketed"—up 6 per cent from 1955. The marketed category includes all gas taken by transmission lines, used in making carbon black, and as plant fuel (including that used on the lease).

The rest of the 1956 gas was reinjected in storage, cycling, or pressure-maintenance operations, or vented.

About 13 per cent of all gas produced went to cycling and pressure-maintenance operations. Operators vented or flared about 4.5 per cent. The commission listed only 826,000,000 cu. ft. as stored.

Lines taking more . . . Transmission lines took the great bulk of Texas gas last year, accounting for 68.5 per cent of all produced.

Gas going to pipelines totaled 4.11 trillion cubic feet—up 6 per cent from 1955. Interstate lines took 62.7 per cent of this amount, or 2.577 trillion cubic feet, to out-of-state markets. The portion taken by the long lines remained about steady from 1955, climbing only 0.2 per cent.

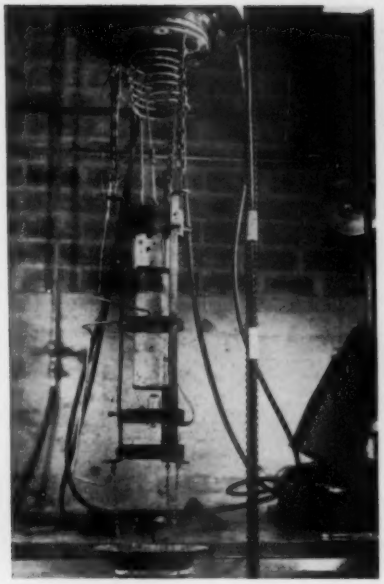
The large gain in the transmission-line take last year was partially offset by a substantial drop in gas volumes used for cycling and for carbon-black manufacture.

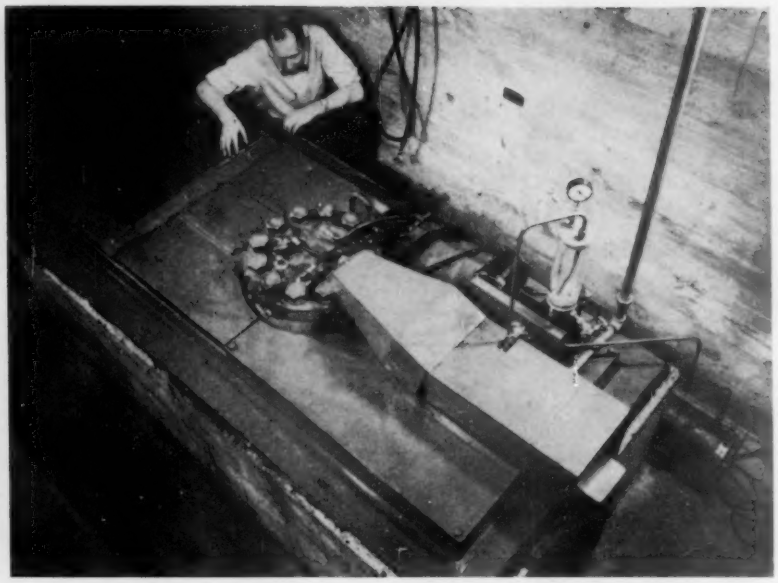
T.G.T., biggest exporter . . . By far the biggest exporter of Texas gas again last year was Tennessee Gas Transmission Co. It exported 597 billion cubic feet as against 532 billion in 1955.

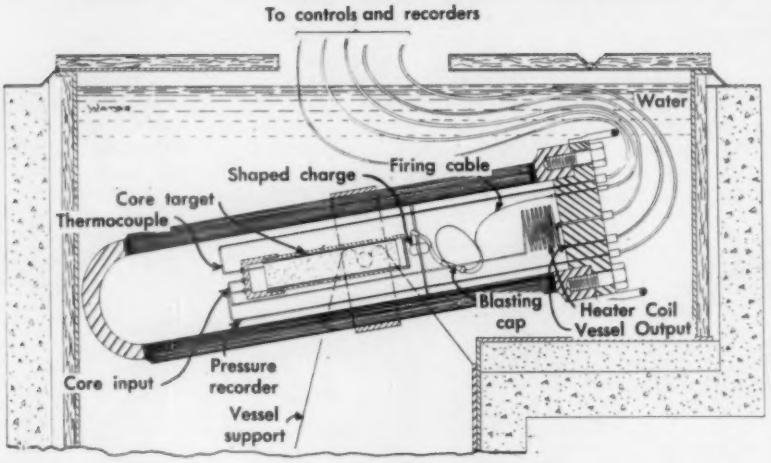
T.G.T., in fact, hiked its lead over El Paso Natural Gas Co. which took 280 billion last year against 279.5 billion in 1955.

Others of the top 10 takers of Texas gas last year were (in billions of cubic feet): Texas Eastern Transmission Corp., 269; Texas Illinois Natural Gas Pipeline Co., 179; Transcontinental Gas Pipeline Co., 166; United Gas Pipe Line Co., 161; Northern Natural Gas Co., 154; Natural Gas Pipeline Co. of America, 146; Panhandle Eastern Pipeline Co., 115; and Michigan-Wisconsin Pipe Line Co., 108.

Record-Breaking Project: This derrick straddles what will become the world's biggest hole—of its kind. But it's not for oil, it's for L.P.G. The derrick is lowering 42-in. steel casing into the main shaft of a storage cavern being mined under the site of Esso Standard Oil Co.'s Bayway refinery at Linden, N. J. Completion is scheduled for late this year. The 10-ft. shaft has been sunk to 300 ft. From the base of this hole, laterals will be mined to hold 300,000 bbl. of liquefied product—more than any cavern has ever held. For the excavation, Esso is using a bulldozer which was dismantled, lowered down the shaft, and reassembled in the cavern.







Perforating guns, top left, are going down hole in the lab. In a special test well, top right, Schlumberger can simulate conditions of a deep well. It means . . .

Guesswork's Gone from Perforating

HOUSTON.—Laboratory tests which simulate down-hole conditions are bringing about new designs in perforating tools.

Schlumberger Well Surveying Corp. announced last week that recent testing methods have helped in development of two new charges for well perforating.

Old testing methods in which a charge was exploded against a surface target showed little more than the depth and size of the hole. These factors didn't always indicate how much oil could be expected to flow from the perforation.

Studies have shown that a perforation may be plugged by the slug and other debris. These are formed by the charge itself, and they often reduce oil output.

Tests in the Schlumberger laboratory simulate the flow of oil into a well after it is perforated. Flow results are measured there in a 6-ft. permeability test well (drawing). This high-pressure vessel measures the flow index from a core. The index determines how effective the perforation is.

The Schlumberger lab is the first of its kind built by a service firm. The company claims it gives a better measure of a tool's efficiency than either the size or depth of the hole.

Officials cite test results to support their claim. One of Schlumberger's new charges is the 2⅛-in. "Capsule-Jet." It first was made in two designs.

Testing with surface targets revealed one design was consistently better with respect to depth of penetration and hole size. But lab tests showed opposite results. The design which appeared inferior in surface targets yielded a higher flow index. This design was adopted.

Schlumberger's "No-Plug" shaped charge also grew out of lab tests. It is said to have little or no plugging action on the perforation. Its flow index is higher than that of previous designs.

Tests involved . . . Two tests are required to measure the flow characteristics of a perforation. The first determines the flow through the ends of a

core. In the second test, one end of the core is sealed; then it's perforated under well conditions. Final step is to measure flow characteristics of the core under such conditions.

The flow index is the ratio of the permeability through a perforation to the permeability across the whole core.

Technique . . . The test core is Berea sandstone cut parallel to the bedding plane. It is 14 in. long and 3⅜ in. in diameter.

After drying, the core is processed to simulate oil and water saturations of a producing formation. It is first saturated with 3 per cent NaCl solution. After that, it is flooded with kerosine until irreducible water saturation is reached. Then the permeability to oil (or kerosine) is determined.

To test it under well conditions the core is encased in 4½-in. o.d., 16-lb. drill pipe. Threads at one end of the drill pipe hold the cover through which the flow will come.

The target is perforated inside the pressure vessel. This is a steel cylinder of 12-in. i.d. and 6 ft. long.

The vessel is tested to 10,000 psi. It contains not only the target, but also harness for holding and firing the shaped charge, flow lines leading to the well and input face of the core, and pressure-recording lines.

A reinforced concrete tank surrounds the pressure vessel. The tank is filled with water which can be heated and circulated to maintain the temperature at 180° F.

Pressures inside the simulated well depend on the type of perforating gun used. Solid or retrieyable-type shaped-charge perforators are fired with a differential pressure into the reservoir. In such case the pressure is set at 1,500 psi. at the face of the core and 1,000 psi. at the back.

Expendable or through-tubing shaped charges normally are fired with 1,000 psi. at the face of the core and 1,200 psi. at the back. This is to simulate permanent-type well completions.

Pressures are maintained or reversed, depending on the type of gun. In the meantime, filtered kerosine flows through the target. Measurement of the flow rate determines permeability under simulated well conditions.

Several major oil firms in recent years have been testing effect of perforations under down-hole conditions. Schlumberger's recently enlarged laboratory was patterned after Humble Oil & Refining Co.'s.

A larger flow lab is being built in the new Schlumberger engineering building now under construction in Houston. It is scheduled to be completed in June.

Pipeline briefs

The natural-gas pipeline industry reached the $2 billion mark in operating revenue last year. The $2,109,059,000 shown in reports to the Federal Power Commission represented an increase of 12.5 per cent over the $1,875,420,000 received in 1955. Sales increased to 7,367,434,000 M.c.f. from 6,676,909,000 M.c.f. in 1955.

Pipelines increased their purchases of gas by 10.9 per cent, from 6,461,286,000 to 7,167,677,000 M.c.f. But the cost of the gas increased 15.2 per cent, from $906,999,550 to $1,045,224,642. Net income of the companies was $241,391,320 last year against $219,061,297 in 1955, an increase of 10.2 per cent.

Columbia Gas Systems, Inc., plans to spend $87 million in 1957 to increase capacity of its vast transmission and distribution network. This is some 32 per cent above the 1956 outlay of $66 million. Deliveries last year increased 11 per cent to 1,653,000,000 cu. ft. per day.

Two Canadian mills will supply $4,000,000 worth of pipe to Northern Natural Gas Co., Omaha, Neb. The reason given for purchasing in Canada was lower prices and quicker delivery. The deals include 350 miles of 2, 3, and 4-in. from Canadian Western Pipe Mills, Ltd., Port Moody, B. C., and 211 miles of 6-in. from Alberta Phoenix Pipe & Tube, Ltd., Edmonton.

Quick write-off has been granted on three pipeline and storage projects for the armed services.

Yellowstone Pipe Line Co. was given 50 per cent of $573,800 for a new pipeline in Washington. Oklahoma Mississippi River Products Line, Inc., was given 65 per cent of $112,350 and 50 per cent of $455,250 for military storage and pipeline facilities in Arkansas. Frank M. Starling was allowed 65 per cent of $429,000 for storage at Doraville, Ga.

Southern Pacific Pipe Lines, Inc., has four spreads working on its 6, 8, and 10-in. products system from Richmond, Calif., to Fallon, Nev.

Morrison-Knudsen Co., Inc., has 21.9 miles of 8-in. and 48.1 miles of 10-in. between Richmond and Stockton, Calif. Hood Construction Co. has 57.4 miles of 10-in. between Stockton and Rocklin, Calif. J. E. Young Pipeline Contractor, Inc., and Engineers Limited Pipeline Co. have two spreads: 33.4 miles of 6-in. and 43.4 miles of 8-in. from Rocklin to Donner Summit, Calif., and 12.6 miles of 6-in. from Donner Summit to Fallon. The entire project is to be finished by September.

Trans-Prairie Pipe Lines, Ltd., is adding 30 miles of 10-in. to its crude system which feeds Westspur Pipe Lines, Ltd., in southeastern Saskatchewan. Trans-Prairie serves Weyburn and Halbrite fields, where production is expected to reach 15,000 bbl. daily when fully developed. The new line, being laid by Henuset Brothers, Ltd., Virden, Man., is to be completed by May 15.

Pembina Pipe Lines, Ltd., has contracted 100 miles of 3 to 12-in. crude gathering lines to Universal Pipe Lines, Ltd., subsidiary of Mannix, Ltd. This is a continuing project to tie in new producing wells in the growing Pembina field. This year's program is to be completed November 1. Universal also will build 32 miles of 16-in. main line from Calmar to Edmonton, starting April 15.

Also for Pipeliners . . .

Crude has started flowing to the Mediterranean port of Banias less than a week after repairs were made to I.P.C. lines in Syria. This and other developments are erasing the Middle East "crisis" (P. 86) . . . The Texas-to-Florida gas line has cleared the final hurdle standing in the way of construction (P. 88) . . . A recently released transcript of a closed-door House subcommittee hearing reveals that federal regulation of independent producers is a costly job (P. 89) . . . Marine Gathering has developed a barge for laying offshore pipelines . . . Texas pipelines may be harnessed with a gas-reserve dedication tax (P. 92) . . . Gas production in Texas hit an all-time high in 1956 (P. 93) . . . FPC may give a quick decision on Texas Eastern's proposal to reconvert the Little Inch to products service (P. 100) . . . The gas-combustion turbine is passing its first test on a major crude or products line (P. 104) . . . Work is pushing ahead on a Venezuelan gas line that will free fuel oil for Europe (P. 105).

PLUS THESE TECHNICAL FEATURES: A method of figuring cost of pneumatic control systems (P. 113) . . . and Pipeline Patrol's construction report (P. 165).

Pontiac Eastern designs unusual refinery because . . .

New Plant Has Two Jobs

● Two-in-one operation at Hattiesburg will handle heavy crude, field distillates without any distillation unit

HATTIESBURG, Miss. — Pontiac Eastern Corp. is building an unusual process scheme into its new refinery here. The design is based on plans to follow a two-in-one operation, handling both crude and field distillates.

The processing basically will work like this: Crude will be flashed and then charged direct to a thermal cat-cracking unit and fluid coker. No crude distillation is included. Field distillate will be processed on a segregated basis.

First process units are due on stream in July. Final completion of the plant is expected in September.

The operation . . . The plant's total charge will be 14,500 bbl. daily.

This charge is broken down to 11,000 bbl. per stream day of 16°-gravity crude and 3,500 bbl. daily of field distillates. Expected realization will be about 10,000 bbl. daily of gasoline.

The field distillates will be charged to a fractionator. Naphtha taken off this unit will serve as charge stock for a 2,500-bbl. Platformer.

Crude, meanwhile, will bypass the conventional distillation process. Instead it will be preheated and charged to a tar separator or flash drum. This crude will be mostly Baxterville but also will include some Heidelburg crude.

Overhead from the tar separator will be fed to a Thermofor catalytic cracking unit. Bottoms will be sent to a fluid coker. This 4,800-bbl. unit is set up primarily to make coke. Its gasoline output will be recycled to the tar separator.

The catalytic cracker has a fresh feed capacity of 9,300 bbl. and a recycle rate of 16,300 bbl. Light cycle oil output will be charged to a 1,200-bbl. Unifiner and then stored as diesel oil product. A sulfuric-acid alkylation plant of 2,500-bbl. capacity will be used to upgrade the catalytic olefins. The unit also will have a Texaco-Stratford reactor section of 3,200 bbl. capacity. Other facilities include amine and caustic treating sections and a sulfur recovery plant with a 20-ton daily output.

The startup . . . When the plant is started up, the tar separator and cat cracker will go on stream first with other units following. The fluid coker will be the last put into operation.

One interesting feature of the plant will be its central control building. The entire process section of the plant will be handled from here. A 108-ft. control panel will be installed in the building. Some 12 ft. of this will be used for recording instruments, and the rest will be a graphic panel.

Fluor Corp., Ltd., holds engineering and construction contracts for the job, and handled process and mechanical design except for some licensed units. The plant operator, Pontiac Eastern, is an affiliate of Pontiac Refining Corp., Corpus Christi, Tex.

Federal Buying Hit

Small refiners say prices on set-asides are too low

WASHINGTON.—Government buying methods came under attack before a congressional committee last week.

Spokesmen for independent refiners charged the Defense Department is ignoring the intent of Congress in applying its set-aside program. Under this program a certain part of the oil contracts of the Military Petroleum Supply Agency is set aside for small operators who cannot compete in price with the large suppliers.

The refiners complained that to get the business, they must accept the weighted average price of regular bids. They contend they should recive the same price paid the highest successful bidder for the unreserved business.

The situation is unfair, they told a Senate small-business subcommittee. Under the Defense Department policy, the MPSA may buy from large refiners at a higher price if the small refiners refuse to sell at the weighted average.

The subcommittee was told of instances where a small refiner got a contract for an unreserved share of business at a higher price than he was offered under the set-aside. This, it was charged, was not the intent of Congress in seeking to protect small business.

The attack was aimed largely at jet-fuel buying. A spokesman for the refiners pointed out small refiners should be encouraged to produce this fuel in the interest of national defense because they are dispersed and less open to enemy attack.

Practices defended . . . Military officials defended the use of weighted prices. But they admitted that proposals to do away with them are being studied.

MPSA officials said the plan is working well. Few complaints have been received from small refiners, they told the subcommittee. There is little difference between the weighted average price given on set-aside orders and the highest price paid on the unreserved portion of military requirements, they contended.

Small business is expected to get more than one-fifth of the MPSA orders this year. This will amount to about $200,000,000, Rear Adm. O. P. Lattu, executive director, testified.

The complaining refiners found an ally in the Small Business Administration. Deputy Administrator Donald A. Hipkins said the SBA opposes the weighted-average price as weakening the set-aside program.

Alaska Law Sought

Delegate presses for bill to open tidelands areas

WASHINGTON.—Alaskan interests are pressing Congress to open up the territory's submerged lands to oil development.

A bill to make Alaska the forty-ninth state is under study in a House committee. But territorial interests have seen statehood delayed for years, and it may be delayed longer. So they are asking that the Interior Department be allowed to lease the inland and marginal areas now.

A bill providing for leasing has been written by Delegate E. L. Bartlett. Encouraging formations have been found in the submerged lands, he said. But the actual values can be learned only by the drilling of wells, which can't be done to any extent unless the lands are made available for leasing.

The submerged lands cannot be leased under present law. When and if Alaska becomes a state, title to submerged lands out to the 3-mile limit will pass to it. Under Bartlett's bill, this would not affect any leases made by the Government. They would simply be transferred to Alaska on their original terms.

Development of the territory's oil and gas resources will be limited so long as the present laws apply, Bartlett said. But there is much interest in Alaska's offshore possibilities. Several companies have shown an interest in further search if they can develop what they find.

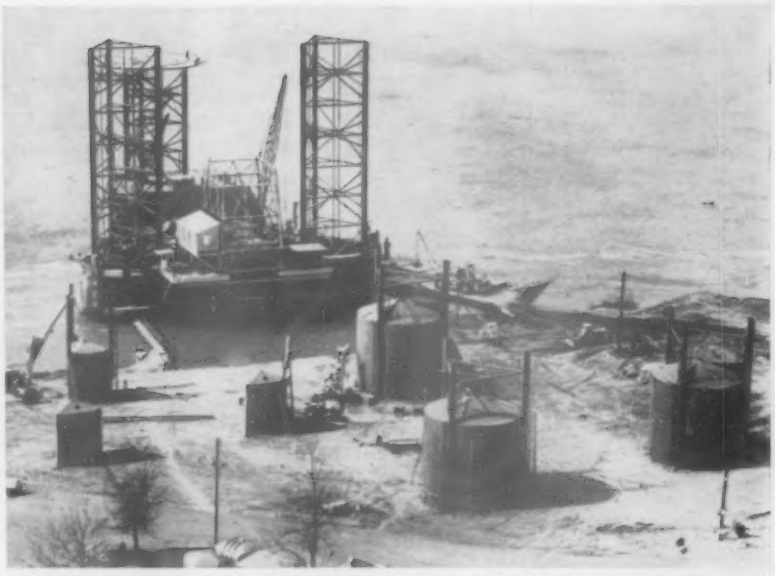
Bartlett's bill would extend the Mineral Act of 1920 to cover the submerged lands in the same way the open public-domain lands are now covered. Ninety per cent of the revenue from leasing would be returned to Alaska for use for roads and education.

B.P. Buys Canadian Stations

MONTREAL — British Petroleum Co., Ltd., is losing no time with its plans to move into the oil picture on the North American Continent.

A month ago B.P. announced plans for a 30,000-bbl. refinery here *(The Oil and Gas Journal, February 18, page 107)*. Last week B.P. started building its marketing fences.

The British firm bought 50 service stations which will market B.P. products beginning May 1. B.P. will absorb the Lake St. John Distributing Co. and the Corporation Saguenayenne, Ltd., as well as a number of stations owned personally by Odilon Chevrier of Chicotoumi, Quebec. All the stations are in northeastern Quebec.



ANOTHER THREE-LEGGED offshore barge moved down the Mississippi River from Vicksburg last week to join a sister-barge in the Gulf of Mexico. It's Zapata Off-Shore Co.'s second in one year, built by LeTourneau, Inc. The three smaller "feet" at left will grow into a medium depth platform for Deepwater Exploration Co. The tank-like legs at right will be part of a heavy-duty unit for Barnwell Offshore, Inc.

Offshore Tripods Multiply

VICKSBURG, Miss.—The Gulf Coast's flotilla of three-legged offshore drilling barges is growing.

Another was completed last week, and two more were ordered at the R. G. LeTourneau, Inc., construction yards here. That makes five either completed or under way. Here's the picture:

... **Zapata Off-Shore Co.'s** second tripod barge started a long trip down the Mississippi River last week (photo). The company's first one—the "Scorpion"—was activated last March *(The Oil and Gas Journal, March 19, 1956, page 121)*.

... **Barnwell Offshore, Inc.,** Shreveport, La., a new company, has ordered a $3,500,000 heavy-duty offshore rig. Like the one completed for Zapata last week, it will have spuds 145 ft. in height, and is designed for operation in 80 ft. of water.

... **Dixilyn Drilling Corp.,** Odessa, Tex., ordered one similar to the Barnwell barge. It will have the tallest spuds of any platform ever undertaken by LeTourneau—175 ft. This will permit drilling in 105 ft. of water.

... **Deepwater Exploration Co.,** Houston, earlier ordered a smaller, more compact medium-depth combination drilling platform.

New production-line operations at the yards mean that all three rigs now under construction will be delivered this year.

Zapata Off-Shore's new barge is known as the "Vinegarroon." It is similar to, but slightly larger than, the "Scorpion," which the company has been using for the past year.

The tripod platform, with 145-ft. legs raised high in the air, is being towed 400 miles down the Mississippi and into the gulf. Its first job will be for Sun Oil Co. off the coast of Cameron Parish, Louisiana.

Designed for drilling in water depths of about 80 ft. or less, the new Zapata unit will be commissioned at New Orleans after its voyage down the river.

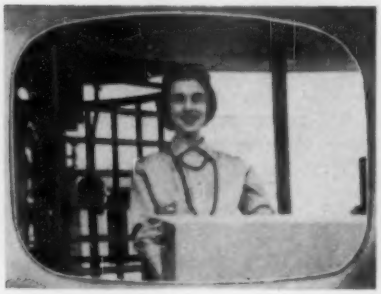
The Barnwell, Dixilyn, and Zapata units will cost about $2,500,000 each. Drilling equipment will boost this figure about $750,000.

The Barnwell platform will have 145-ft. legs and will be designed for water about 80 ft. deep. Legs of the Dixilyn platform will be 175 ft. long, the tallest built in the tripod design. During non-hurricane season the unit can operate in water depths of about 105 ft.

New company . . . Barnwell Offshore, Inc., is a new firm organized by Barnwell Production Co. and Frank H. Harrell, Shreveport.

R. S. Barnwell, Sr., is chairman of the board; R. S. Barnwell, Jr., is president; and Harrell, formerly vice president in charge of Midstates Oil Corp., is the executive vice president and treasurer. Morton M. Kinzler is vice president and secretary of Barnwell Offshore and Otis Soloman is general superintendent.

Cameras scanning entrance on the outside . . .



. . . Flash these pictures to monitors on the inside.

TV Goes on Guard Duty for Esso

BATON ROUGE, La.—The audience isn't big enough to brag about, but employes of Esso Standard Oil Co.'s huge Baton Rouge refinery are now appearing daily on television.

The company has installed a closed-circuit TV system at an employe entrance to permit identification and admission of personnel by remote control.

The employe presses a buzzer to alert the plant's guard headquarters and then shows an identification badge to a small camera. A larger camera centers on the employe. The pictures, of the badge and employe, are flashed simultaneously on receiving sets in the guard center.

A guard then flashes the employe a green light and unlocks the gate by remote control. The gate remains unlocked just long enough to admit one person. The large camera continues to scan the entrance area so the guard can make certain no unauthorized person slips through.

Gilsonite Plant Tools Up

GRAND VALLEY, Colo.—American Gilsonite Co.'s $12,000,000 gilsonite processing plant near here is scheduled for full production in early summer.

Lee Morris, manager of field operations, said construction work should be completed in May. The plant will go on stream a few weeks later on a 24-hour, 7-day schedule.

Initially it will transform solid hydrocarbon gilsonite into 265 tons of metallurgical coke and 1,300 bbl. of high-test gasoline daily.

Industry briefs

Standard Oil Co. of California has stopped its pressure-maintenance program in Buena Vista Hills field of Kern County, California, and will convert the field into a gas-storage unit. Seventy-four billion cubic feet of gas have been injected into the field since 1949. Socal will start withdrawing the gas as soon as a carbon dioxide reclaiming plant is completed.

Louisiana's oil production allowable will be cut in April as result of increased output in the Middle East, Conservation Commissioner John B. Hussey announced. The new allowable is expected to be set at about 920,000 bbl. daily. Current allowable is at a record high of 990,642 bbl. daily. Hussey indicated a further cut may be ordered in May.

A bill to boost Montana's tax on oil production from 2 per cent to 2½ per cent was passed in the state senate last week. It goes to the governor for final approval. The bill, which will increase the state's revenue by an estimated $300,000, exempts stripper wells averaging less than 5 bbl. daily.

Musgrove Petroleum Corp., Wichita, has purchased 70 producing wells in Kansas from Frank G. Wood of Great Bend, and Welch & Olsson Drilling Co. and E. G. Bradley of Wichita. The $1-million deal involves 550 bbl. of production daily in west central Kansas. Reserves are estimated at 4 million barrels. Musgrove is a subsidiary of General American Industries.

A 40,000-ton supertanker—"Canada Shell"—will be built at Lauzon, Que., for Shell Oil Co. of Canada, Ltd. The 710-ft. vessel will be completed in 1960. Carrying capacity will be 345,000 bbl. of oil. Davie Shipbuilding Co. will build the ship for Papachristidis Tankers, Ltd., who will turn it over to Shell Canadian Tankers on a 20-year charter, with a renewal option. The tanker will cost $11 million.

Acreage limitations on oil and gas leases on the Indian lands other than those of the Osage and Quapaw tribes in Oklahoma have been raised by the Interior Department.

The maximum area that may be covered by a single lease for oil and gas will be 2,560 acres. This has been the general rule in the past. But previous limits on the amount of Indian land that may be held under more than one lease in a particular state will be waived in the future.

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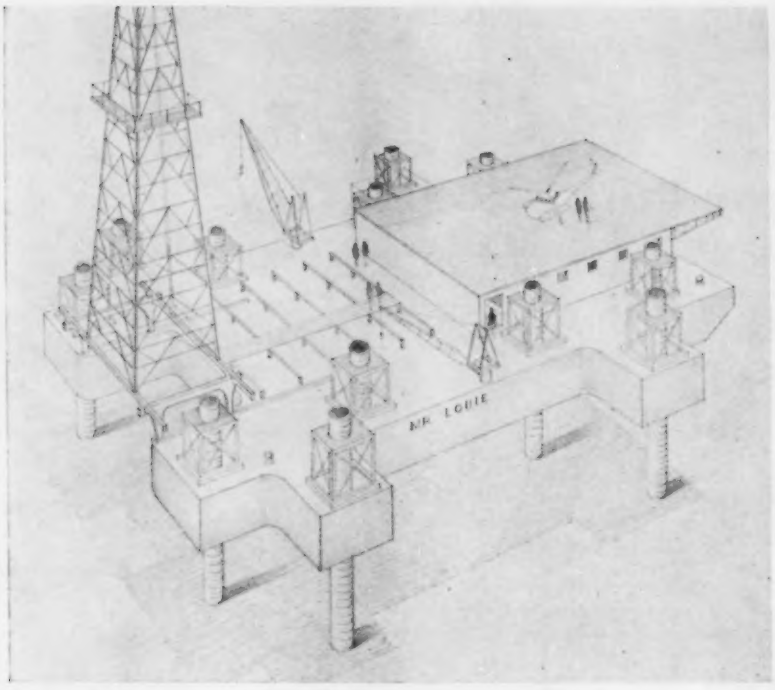


With jacks that are always locked:

Firm Plans Deep-Water Barge

NEW ORLEANS.—The recently formed Universal Drilling Co., Inc., has announced plans to build an offshore barge to drill in 120-ft. water.

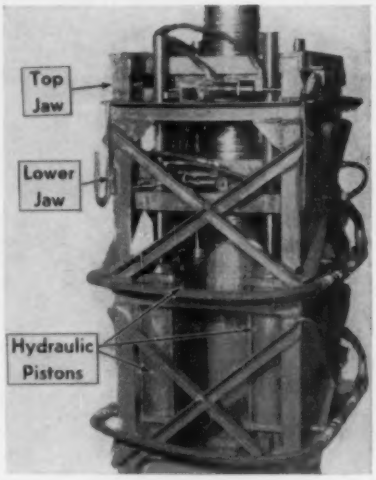
Key feature of the proposed barge is a double-locking hydraulic jack invented by Louis J. Roussel, New Orleans oil operator and president of the new firm.

Cost of the barge, complete with drilling equipment, is estimated at $3,000,000. This is comparable to the cost of existing units designed for much shallower water.

The single-hull barge will be supported by 12 caissons. Each will be 6 ft. in diameter and 240 ft. long. Eight of the spuds, or caissons, will extend through the barge proper (see drawing).

To increase the vessel's stability, the other four legs will go through four "wings," two on each side of the main platform. The wing caissons will angle outward at the bottom, where they will be planted deep in the ocean bottom.

A working model of the jacks has been erected in the company's headquarters in downtown New Orleans. There will be 12 jacks, one to raise and lower each leg independently. The jacks may be controlled manually or by electricity from a central panel.



How jacks work . . . Roussel said the jacks operate on the same principle as that used by a youngster in climbing a pole. The lad keeps his legs firmly gripped around the pole while he raises his arms to get another hold. His weight is always supported by his legs, his hands, or both.

Each jack has a fixed pair of retractable half-round double jaws to fit around the caisson (see photo). A similar pair of jaws is mounted on a rigid frame attached to the power arms of the four hydraulic pistons.

The jacks are always locked either in fixed position or movable position by automatic safety valves which engage one set of jaws before releasing the other set.

A full-scale jack can lift or lower the barge 4 ft. per stroke. The model works on a 1-ft. stroke.

Jaws supporting the spuds mesh with steel bands welded around the caisson. Plans call for bands to be made of 1⅛-in. steel plate 8 in. wide. They would be welded 9 in. apart, giving the leg the appearance of a winged column.

Once it is raised to the drilling position, 10 wells may be sunk from the barge without lowering it to the water surface. When the barge is lowered to floating position the jacks will retract the legs, and the vessel will be ready to tow to the next location.

FPC Speeds Decision

Fate will be known soon for plan to convert Little Inch

WASHINGTON.—A quick decision on return of Texas Eastern Transmission Corp.'s Little Inch pipeline to products service is in sight.

The Federal Power Commission is bypassing the usual examiner's report. It has ordered the case to be brought before it directly without waiting for the examiner's findings.

The line is one of a pair built during World War II to move products from the Southwest to the East Coast. When Texas Eastern bought them after the war they were shifted to natural gas.

Shift of the Little Inch back to products service was approved by the FPC in June 1955. Barge interests opposing the conversion went to the courts. Last year the District of Columbia Court of Appeals sent the case back to the FPC with orders to give the barge companies the opportunity to present their views which they claimed had been denied them.

Hearings recently were ended on the effect of the shift upon other oil carriers, possible monopoly aspects, and the effect on national defense.

The FPC explained its desire to act quickly is based on the savings which Texas Eastern says can be made. Abandonment of gas service would save $4,000,000 a year, the company says. The matter already has been before the FPC for some 2½ years.

If the change is approved, Texas Eastern has offered to make the Little Inch the base of a defense pipeline from the Southwest to the coast.

The offer competes with that of the American Pipe Line Corp. The Office of Defense Mobilization will probably decide shortly whether the Government will aid in the building of the line.

New Imports Plan?

Idea of fresh start talked, but opposition still strong

WASHINGTON. — The Suez crisis has given a new aspect to the problem of oil-import control.

The idea of revising the Cabinet Fuel Committee's 1955 formula has been raised. It might be necessary to do this to protect the increased domestic production sparked by the Oil-to-Europe program.

When the Middle East supply lines return to normal, this output will have to look to domestic outlets. Imports, even at the recommended relation to production, might create a surplus problem here. Some of the importing companies are concerned over the prospect, although nothing has developed to show that their concern is well founded.

There are two sides to this particular picture:

. . . Domestic producers would not take kindly to cutbacks to make room for foreign oil. Neither would the state commissions. Both would resent the idea that they could be called upon for aid in emergencies and shoved back when the emergency ended.

. . . Many importing companies are tied up in long-term contracts for foreign oil. But they also have to buy even more oil in this country. If they cut back their buying here to make room for foreign crude, they will antagonize the states and the producers alike, which they would not want to do.

The 1955 formula is a matter of repeated discussions in government circles. Each time it has come up, the decision has been to stand by it.

There is no sign of a change in position now. But one official pointed out informally that if there is any suggestion in the near future to revise the formula downward there might be opposite pressure further along the line if domestic reserves and production failed for any reason to keep pace with rising demand.

Import schedules . . . Importers are due to file new schedules with the Office of Defense Mobilization by the end of the week. The schedules were requested in a letter sent out March 5 by Mobilization Director Arthur S. Flemming.

Domestic producers, however, see a delaying tactic in Flemming's letter. Flemming said that after the schedules have been studied, the companies will be given a chance to revise them downward if they do not meet the formula set out by the Cabinet Fuels Committee in 1955.

Processing briefs

Carbide & Carbon Chemicals Co. will enter the fluorocarbons field with construction of a 50-million-pound unit at Institute, W. Va. Completion is set for late 1958.

The new plant will push U. S. capacity to over 300 million pounds per year. End use of these organics include aerosol propellants and refrigerants. This latest project is a result of Carbide's extensive research program, which cost $55 million last year. New plant construction in 1957 is expected to exceed last year's total of $144 million. Carbide & Carbon is a division of Union Carbide & Carbon Corp.

Phillips Petroleum Co. awarded a construction contract for a 16,000-bbl. low-end-point catalytic reforming unit, plus desulfurization facilities, at its Sweeny, Tex., refinery to Fluor Corp. of Los Angeles. Construction will get under way by July 1. The work will be completed by January.

Construction has been started on a 22,500-bbl. Platformer and steam generating facilities at Tidewater Oil Co.'s Avon refinery near San Francisco. The steam boiler, with a 500,000-lb. per hour capacity, will be fueled with coke produced from a recently completed 42,000-bbl. fluid coking unit. The units will be completed early next year. Bechtel Corp. is contractor.

Du Pont has found that its fuel-oil additive No. 2, normally used for home heating oil, gives good results in residual-fuel oil as well. Sludging and filter plugging was prevented in tests involving a refinery, large apartment projects, a country club, a public school, and a power station.

The Asphalt Institute is sponsoring a second graduate study program in asphalt paving technology at the University of California's Institute of Transportation and Traffic Engineering. The 8-week course beginning June 17 at Berkeley is open to qualified engineering instructors. Those from the western states will be favored, but others may be accepted.

American Motors Corp. has tagged its electronic fuel-injection system at $395 extra on the new Rambler Rebel luxury model. A four-barrel carburetor is standard equipment. Horsepower rating is 225 without fuel injection and 288 with it. Production of the Bendix injection units is now under way, but will not be available in assembled cars until a later date.

The Mobilgas Economy Run is set for April 14-18. The route this year will start in Los Angeles and wind up at Sun Valley, Idaho. In recent years, 98 per cent of America's automotive production has been represented on the run. Entry lists for the four price classes are now open, according to Vern Bellman, director in charge of domestic marketing of Socony Mobil Oil Co., sponsor of the event. This is the twenty-first year of the economy competition.

Two new refinery standards published by the American Petroleum Institute are now available to the industry. One is A.P.I. Standard 610, second edition, which covers complete A.P.I. specifications for centrifugal pumps for general refinery service. The other is Standard RP-500, second edition, which outlines procedures for classifying areas for electrical installations at refineries.

Also for Refiners . . .

The big O.C.A.W. and smaller independent unions are drawing closer together in their wage drive now that Indiana Standard has settled with its independent union for 4 per cent wage hike at Whiting refinery (P. 85) . . . Saudi Arabian crude now is moving again to the Bahrain refinery. Middle Eastern crude also will soon reach Western European refineries (P. 86) . . . Oil marketers are speaking out against Sen. Kefauver's bill to knock out the "good faith" decision of the Supreme Court (P. 87) . . . Pontiac Eastern's new Hattiesburg, Miss., plant will be a two-in-one operation, handling both heavy crude and field distillates without any distillation unit (P. 96) . . . Corrosion engineers report use of anodes for process vessels has cut maintenance-labor costs $1,200 a year in one plant (P. 102).

PLUS THESE TECHNICAL FEATURES: Fractionation systems are blitzing alkylation problems; first of a series on case histories (P. 110) . . . A method for figuring cost of pneumatic control systems (P. 113) . . . How Esso eliminated need for explosionproof motors at Baton Rouge (P. 128) . . . On The Job . . . In the Plants (P. 134) . . . The Foreman's Page (P. 151) . . . PETROdatics (P. 153) . . . and Questions on Technology (P. 156).

Plant Corrosion Cut

Use of anodes for process vessels cut maintenance-labor costs $1,200 a year in one plant, N.A.C.E. is told

ST. LOUIS.—A new wrinkle has been added to an old theory of corrosion control to cut maintenance and prolong life of gasoline-plant equipment.

Arkansas Fuel Oil Corp. turned to cathodic protection to whip one phase of a corrosion problem in its East Texas plant. The company adapted this technique to stop water-side corrosion of process equipment. The annual saving included $1,200 in labor alone.

Details of the plan were outlined last week before the oil and gas-production symposium of the National Association of Corrosion Engineers. The symposium also included discussions on a new interpretation of tubing surveys to improve corrosion control, the current requirements for cathodic protection of casing, and testing of corrosion inhibitors.

Plant-protection program . . . M. J. Olive, corrosion engineer for Arkansas Fuel, said the program was developed to curb an alarming increase in damage to condensers, coolers, and exchangers.

Experiments indicated the solution was cathodic protection, using small coated magnesium anodes as a current source. They succeeded in:

. . . Stopping corrosion on tube sheets in the equipment.

. . . Doubling useful life of the equipment.

. . . Stopping the plugging and fouling of tubes. This resulted in higher cooling efficiency, less production loss due to shutdown and equipment failure.

. . . Saving $1,200 annually which had been spent on labor to repair and clean condenser and coolers.

The problem was traced back to a frequent trouble spot—the need for treating cooling water, an operation which costs the industry more than $16 million per year. Arkansas Fuel's supply contained a heavy concentration of solids (5,000 p.p.m.). They included chlorides, chromates, phosphates, decayed algae, dirt, and debris.

To install a filter system to clean up the water required a major shutdown and revamping of the plant. Since the trouble involved both corrosion and scale formation, cathodic protection was selected.

Plant tests . . . Two depropanizer reflux condensers which were suffering heavy metal losses and had to be cleaned every 2 or 3 months were the test installations.

Both condensers were cleaned. Only one was equipped with anodes. After 6 weeks, an inspection showed:

. . . The condenser without anodes had the usual corrosion-product buildup, and active corrosion.

. . . The condenser with anodes was almost free of scale. Instead of the usual bright metal, it had a calcareous coating indicating cathodic protection. Each anode had a metal loss of about 75 per cent and a heavy magnesium salt buildup.

On the strength of these results, anodes were placed as permanent installations in each vessel in the plant. Neoprene was discarded as a coating in favor of polyvinylchloride. The neoprene blistered and allowed excessive current output which cut anode life.

Results . . . Each vessel was inspected again after a year. Here's what was found:

. . . No scale buildup occurred.

. . . No increase in pit depth or tubesheet corrosion.

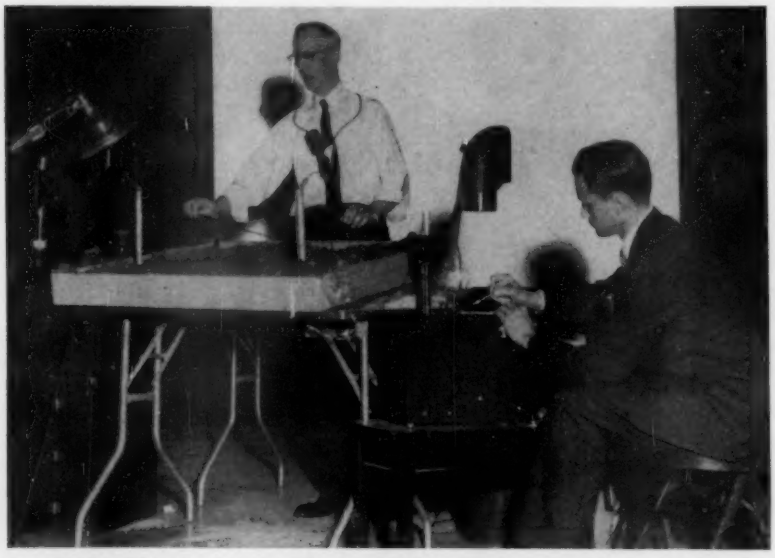
. . . Water flow was good.

. . . Equipment shutdowns were fewer.

Arkansas Fuel had been spending $100 per condenser for cleaning and repairing each year. This amounted to $2,000 in maintenance labor in the 20 exchangers before anodes were installed. The average first cost of the anodes per condenser was $40, or a total of $800. There were no added costs during the first year, making a saving of $1,200. It's estimated the saving will be the same for the third, fourth, and fifth years.

Further benefits were realized from higher cooling efficiency, longer equipment life, and less down time. This could well be more than 10 times the value of the labor savings, according to the company.

Arkansas Fuel's study showed that in cooling water, where mineral content is high, dianodic water treatment isn't enough. The answer is a combination of water treatment and cathodic protection. This gave the most economical and practical way to control corrosion and scale.



CATHODIC-PROTECTION demonstration for the corrosion engineers was presented by M. C. Miller, standing, and A. W. Peabody, right, of Ebasco Services, Inc.

Stewart Heads N.A.C.E.

ST. LOUIS.—W. H. Stewart, of Sun Pipe Line Co., Beaumont, last week took over as 1957-58 president of the National Association of Corrosion Engineers.

He succeeded W. F. Fair, Jr., of Koppers Co., Inc., Pittsburgh.

L. L. Whiteneck, Plicoflex, Inc., Los Angeles, was named vice president in the annual N.A.C.E. mail balloting of the membership, and A. L. Stegner, Tennessee Gas Transmission Co., Houston, became treasurer.

Directors elected were E. G. Brink, American Viscose Corp., Marcus Hook, Pa.; R. E. Kuster, Union Gas Co. of Canada, Ltd., Chatham, Ont.; R. S. Treseder, Shell Development Co., Emeryville, Calif.; F. E. Costanzo, Manu-

facturers Light & Heat Co., Pittsburgh; and John B. West, Aluminum Co. of America, Atlanta.

Walter F. Rogers, a former association president and the second person to join the infant organization in 1945, was honored with the Frank Newman Speller Award for achievement in corrosion engineering. He is in the Houston production division of Gulf Oil Corp.

Production Meet Set

Permian basin lecture to be in Midland April 18-19

MIDLAND.—The Permian Basin Oil Recovery Conference will be held here at the Yucca Theater April 18-19 under joint sponsorship of the Permian Basin Section of the Society of Petroleum Engineers of the A.I.M.E. and the Texas Petroleum Research Committee.

Dr. G. H. Fancher, T.P.R.C. director, has announced the following papers:

Thursday, April 18
9:00-11:45 a.m.

"Whole-Core Analysis Methods and Interpretation of Data from Carbonate Reservoirs" by R. S. Bynum, Jr., and E. H. Koepf, Core Laboratories, Inc.

"Log Interpretation in Heterogeneous Carbonate Reservoirs" by R. H. Winn, Halliburton Oil Well Cementing Co.

"New Calibration and Conversion Techniques for Radioactivity Logs" by V. J. Mercier, The Western Co., and W. H. Redford, Lane-Wells Co.

1:30-5:00 p.m.

"Well Completions are Especially Important in Permian Basin Limestone and Dolomite Wells" by D. C. Brown, Sun Oil Co.

"Fresh Water Fracturing in Oil Reservoirs" by R. E. Hurst, J. T. Rollins and H. A. Stewart, Dowell Incorporated.

"A New Technique for Examination of Oil Field Brines" by W. P. Aycock and George W. Crawford, T.P.R.C., and E. W. Hough, University of Texas.

"Flooding in South Ward—Analysis of a Lease Performance" by A. B. Dyes, P. H. Braun and B. E. Coles, Jr., Atlantic Refining Co.

Friday, April 19
9:00-12:00 a.m.

"Reservoir Limit, Well and Formation Evaluation" by Park Jones, University of Houston.

"Rate of Return Calculations as a Measure of Investment Opportunities" by James W. Glanville, Humble Oil & Refining Co.

"Interpretation of Capillary Pressure Data from Carbonate Reservoirs" by W. R. Aufricht and E. H. Koepf, Core Laboratories, Inc.

"Laboratory Study of Oil Recovery by Solvent Flooding After Water Flooding" by A. W. Talash and Paul B. Crawford, T.P.R.C.

1:30 to 5:00 p.m.

"Equilibrium Calculations on the Kelly Snyder Reservoir" by Harvey T. Kennedy and Stephen G. Dardaganian, T.P.R.C., and John L. Clanton, Pan American Petroleum Corp.

"SACROC Unit Operations" by H. H. Allen and C. R. LaRue, SACROC Unit.

"Secondary Recovery Operations in Fullerton Clearfork Unit" by W. E. Nolan and George R. Locker, Monterey Oil Co.

Tidelands Sale Dims

Land Management Bureau apparently has change of mind, indicates bidding out until after Supreme Court ruling

WASHINGTON.—Further lease sales on the outer Continental Shelf will be held up until the Supreme Court rules on Louisiana's boundary, it was indicated here over the week end.

The possibility that a sale might be held before the end of June was raised last January by Edward Woozley, director of the Bureau of Land Management. He told a House appropriations subcommittee that a sale which might bring in $72 million in bonuses was being studied.

Bureau officials now are understood to be leaning toward the idea of waiting until the Supreme Court decides whether Louisiana's boundary is 3 miles out in the Gulf of Mexico or 3 leagues, as the state claims.

The Government's suit to declare a 3-mile boundary is scheduled to be argued before the Supreme Court April 8. A decision is expected before the court ends its current term early in June. But it could be delayed until next October if the decision is difficult to make.

Even if the court does reach a decision before it recesses, it is not likely that a sale could take place before the end of the year. The last sale, in July 1955, followed the receipt of nominations by 5 months.

At that time, nominations were submitted in February. This was in accord with the BLM practice of finding out first what areas oil and gas producers are interested in. Leases to be offered are selected from the areas that are nominated.

If there is a similar time lapse between the next request for nominations and the actual sale, it would be late in the year, at best, before the sale could take place.

Short-cut possible . . . The only shortcut that could speed up action would be a decision by the BLM to regard nominations made in 1956 as current. These nominations never resulted in a sale.

Some 794,500 acres were nominated in February 1956, and set for sale May 15. But the sale was first deferred and then canceled after Louisiana succeeded in having it enjoined in a state court.

While this course is possible, it is considered unlikely, however. More probably, new nominations would be sought. Geological and geophysical exploration in the past year have considerably altered the acreage that would be nominated.

While the bureau is said to prefer that the court act before it holds another sale, it is indicated the wait would not be indefinite. If a delay of months appears likely, it is possible that the BLM will ask for nominations covering areas that are not in dispute.

The last sale, in 1955, brought the number of leases sold to 240. They covered 889,376 acres off Louisiana and Texas. Gross receipts from the three sales held amounted to $252,-141,077. That part applying to the areas in dispute is being held in escrow until the Supreme Court acts.

"Fair Field" Prices Legal

LITTLE ROCK, Ark.—The "fair field" method of pricing natural gas is now legal in Arkansas.

Gov. Orval Faubus last week signed a bill legalizing the method. It goes into effect immediately and voids an Arkansas Supreme Court decision prohibiting use of the method.

The court had ruled that Arkansas Louisiana Gas Co. could not base its charges to industrial customers on "fair field" theory. The gas company had been charging the same price for the gas it produced as it would have to pay if the same gas were purchased from other producers.

Now that the method is legal, one big question left is what refunds are due companies for gas service during the period the court held such pricing unlawful. The companies which brought the original suit have since signed contracts with Arkansas Louisiana Gas at rates higher than "fair field" prices.

Rocky Mountain Firm Formed

CASPER, Wyo.—Wyoming Oil & Development Co., Inc., has been organized here to explore and develop shallow oil production in the Rocky Mountain area.

The first test is under way. It's a 1,500-ft. test of the Shannon sand on the southeast flank of the South Pilot Butte field near Riverton, Wyo.

The new firm was organized by John E. Schumacher, Jr., president; Robert J. Murphy, vice president; Herbert J. Taylor, secretary; and Robert Kimball, director, all of Casper. Schumacher is an independent operator.

Libya Latest Oil Hot Spot

● American majors lead race into once ignored desert area following French strikes in the Algerian Sahara

FRENCH discoveries in the Sahara region of Algeria are going to spark large-scale drilling operations in the Fezzan Province of Libya to the east.

Two American majors plan wells deep in the Libyan interior this year. Several other companies are applying for acreage in the area that was all but ignored a year ago.

Here are the drilling plans to date:

. . . Esso Standard (Libya), Inc., plans to spud a well by late summer, probably on what it calls its Block 1 in Fezzan. The Jersey Standard subsidiary was the first company granted acreage in Libya in November 1955. Jersey's first block was this one.

The tract is 20,788 sq. km. lying along the Libya-Algeria frontier at least 325 miles south and to the west of Tripoli. It is just opposite this tract and on the Algerian side of the poorly defined boundary that the French-Shell company is developing Edjele field *(The Oil and Gas Journal, March 11, page 116).*

. . . Mobil Oil of Canada plans a well in the same area later in the year, probably October. The Socony Mobil subsidiary will test a block of more than 19,000 sq. km. which it has held only since May 1956.

The contractor . . . Both wells will be drilled on contract by Camdrill International, Inc., an affiliate of Southern California Petroleum Corp.,

R. O. Turner, executive vice president of Camdrill, revealed preliminary plans for the two wells last week and the companies confirmed the operation. Camdrill will maintain an operational office in Tripoli.

A portable rig rated to 5,000 ft. will drill the Jersey test. The rig has been used by Camdrill on contract to Jersey in Sicily.

Fezzan . . . When Libya began granting exploratory concessions under its new oil law more than a year ago, the remote southwestern province of Fezzan was almost ignored by the dozen companies who applied for land. Only the Jersey Standard company and Libyan American Oil Co. (Texas Gulf Producing Co.) asked for acreage in the province.

Now things are different. The Edjele discovery by Cie. de Recherches et d'Exploitation de Petrole au Sahara (C.R.E.P.S.) in February 1956 did the trick. As soon as the Algerian discovery was confirmed by the French-Shell company, others became interested in Fezzan.

Cie. Francaise des Petroles, probably France's largest oil company, applied for and received a tract of 9,720 sq. km. to the north of the Jersey tract. C.F.P. is also active in Algeria to the west.

Jersey added another 6,823 sq. km. to its original concession on the west.

Mobil Oil of Canada got the 19,715 sq. km. tract on which it plans a well this year. Since that time the Socony company has added another tract to the west of this block, but the addition lies in the province of Tripolitania.

There were reports last week that several other companies have made application to the Libyan Government for acreage in the remote and almost trackless desert area.

An exception . . . While other companies are scrambling for a part of this section, Libyan American is reversing the trend. The company which drilled Libya's first well, gave up its Fezzan acreage.

The Libyan Government revoked the concessions because Libyan American failed to do active exploratory work on the acreage within 8 months as required by law. The company said last week that it had decided the cost of exploring the area was so high it was not interested.

The Libyan American acreage consisted of two tracts, both more than 500 miles south of the Mediterranean Coast. One bordered Jersey's acreage on the south and contained 33,488 sq. km. The other was 39,637 sq. km. about 90 miles to the east.

These two huge tracts are available to the latecomers.

A geologist last week described the Paleozoic basin which straddles the Libyan-Algerian boundary in this area as "about as big as Texas."

New twist in crude pipelining:

Gas Turbine Passes First Test

THE first gas-combustion turbine ever installed on a major crude or products pipeline is now in full operation in Saudi Arabia.

The unit was one of eight ordered by Arabian American Oil Co. and Trans-Arabian Pipe Line Co. The turbines were especially designed for heavy-duty use in portable, unattended, auxiliary pump stations.

They are the key to an expansion program which will increase throughput capacity of Tapline to 425,000 bbl. daily by the first of next year.

The turbine now operating was installed on a permanent foundation at Wariah, a pump station on Aramco's 250-mile section of the line. It was set up after a 7-day haul from Ras Tanura.

During a 48-hour test run, the only adjustments made were minor changes to the fuel heaters and the air system.

The turbine itself is a 5,000-hp. General Electric gas-combustion unit driving a Byron Jackson centrifugal pump. The complex auxiliary pump package includes a control unit, communications van, and a 93-ft. radio tower.

The van carrying the turbine and pump weighs 124 tons, the separate control van, 55 tons. Each is portable and designed to fit on permanent foundations.

Still testing . . . Some increase in throughput will be possible with the new unit. But its main purpose still is for testing. Daily checks will be made of the equipment until the operation proves reliable.

Later, checks will be reduced to one or two a week.

The turbines will be fed by crude taken directly from the line. Under full load, each of the units is expected to burn about 430 bbl. daily.

Tapline will have four auxiliary units on its 750-mile section of the line. Another turbine driven pump will be installed at a permanent pumping station. Aramco will have two auxiliary units.

The eighth turbine will be a spare. It will temporarily replace other units moved to Turaif for yearly inspection and overhaul. Because the spare can be installed on duplicate foundations, shutdowns will be avoided.

A joint of 20-in. pipe swings through the air . . .

It is cleaned and primed, then . . .

Venezuelan Gas Line Will Free Fuel Oil for European Market

THIS pipe will convert a Venezuelan refinery's boilers from oil to gas. It's part of the proposed 177-mile natural-gas line which will link the La Paz field with Cia. Shell de Venezuela's big Cardon refinery.

Work started on the overland phase earlier this year, and by last week nearly 20 miles had been buried, 45 miles strung, and 66 miles cleared for right-of-way.

Lake and gulf crossings involved in moving the gas to the refinery were completed in 1956 *(The Oil and Gas Journal, January 14, page 87).*

The 20-in. carrier will move 106,000 M.c.f. of gas daily when completed late this year. The natural gas will fire refinery boilers and make available for export additional fuel oil now being used as refinery fuel.

Shell's Cardon plant has a design capacity of 145,000 bbl. daily, but actual throughput last year was about 177,500 bbl. daily. An additional 80,000 bbl. daily in crude capacity is being added to the plant. The new unit will go on stream next year.

Williams Brothers Co., Tulsa, is handling the pipeline project. Unlike most pipelines which rest on sleepers in Venezuela, the Shell line is being coated, wrapped, and buried. The project will cost $21 million.

Coated with cement and wire mesh (below).

Two French Wildcats Hit

● Discoveries may mean deep gas-condensate play in Parentis, and southwest France's first sand production

FRENCH geologists are chewing on two new tasty tidbits. Both are causing a good deal of speculative conversation in connection with prospects for southwestern France's Aquitaine basin.

One is a deep gas-condensate discovery at Parentis. The other is the first sandstone discovery in the basin—still unevaluated. Here's the score at the end of the week:

. . . A deep pool test, Parentis 101 at the east end of Parentis field, blew out at 12,300 ft. and was flowing wet gas. Esso-Rep engineers were moving in with additional mud pumps and weighted mud to kill the well. Relief line had already been laid away from the rig, and the flow ignited.

. . . Clermont 2 was drilling ahead about 9½ miles southeast of Dax after encountering the Aquitaine basin's first productive sandstone.

The blowout . . . Parentis 101 blew out while the crew was coring at about 12,300 ft. in the Lower Jurassic.

The company had not yet completely evaluated the find, but the high-pressure wet gas discovery is regarded as significant. Parentis, by far France's biggest field to date, is now producing more than 25,000 bbl. daily. The productive Parentis wells are flowing or pumping from limestone or dolomite at 7,100 ft.

Esso-Rep anticipated no trouble in killing the well. Blowout preventers were closed around the drill stem and the pumps were ready for the heavy mud.

Clermont . . . Near Dax in the same general area of Southwest France, Ste. Nationale des Petroles D'Aquitaine (S.N.P.A.) was drilling ahead at Clermont 2 aimed at the equivalent to the Parentis producing section.

The thing that caught the eye of French and interested American geologists was a drill-stem test of a 105-ft. Upper Cretaceous sandstone interval between 6,260 and 6,365 ft. A 75-minute test produced 9 bbl. of 35°-gravity crude, 5 bbl. of water, and a show of gas from the impregnated sandstone.

The test itself was not enough to excite many people, but the fact that it was made in sand is regarded as interesting. All the Aquitaine basin's current production is from limestone. The Clermont 1 was bottomed at 11,080 ft. as a dry hole after encountering several noncommercial shows.

The basin's current production rate is higher than Esso-Rep would like to see it. The Suez-created oil shortage has caused the company to produce Parentis and three one-well fields at a higher rate.

The one-well fields at Mothes, Lugos, and Lucats are making 300 bbl., 300 bbl., and 70 bbl. daily, respectively. Esso-Rep, controlled by Jersey Standard, and partially owned by the French Government and Gulf Oil Corp., plans to reduce output when French imports return to normal.

San Andres Booming

Fast-moving Mexican field doubles output in 2 months

PETROLEOS MEXICANOS is speeding drilling on a structure that shows signs of developing into one of Mexico's best fields.

The field is San Andres in the Tampico embayment. It is about 10 miles southeast of the southern rim of Poza Rica production and 5 miles southeast of Papantla.

Twelve rigs were working in the area last month and Pemex expected to have three more working by last week. Pemex expects the field to support 75 to 100 wells. It plans to have 50 completed this year.

Output has jumped to 10,000 bbl. daily from 5,000 bbl. daily in January when five wells were on production. The wells, except the discovery, produce 32°-gravity crude from a 247-ft. section at an average depth of 11,055 ft.

The 1 San Andres was brought in last spring. It initially tested 3,000 bbl. daily of 18°-gravity crude through a 25/64-in. choke. Bottom-hole pressure was reported to be 7,500 psi. The well was placed on production from 9,369-10,521 ft. But high pressure gas broke the cement above 9,396 ft. and the well produced through casing.

Pipeline connection . . . A 12-in. pipeline has replaced a temporary line, permitting further production increases. The line connects with the main pipeline system feeding the Mexico City, Salamanca, and Tampico refineries.

Pemex geologists are not yet certain whether the deep production is from Lower Cretaceous or Jurassic. If the zone proves to be the Jurassic, found in Tamaulipas field, there are hopes that the pay extends to older producing areas. This would include Golden Lane, Tampico, and Ebano fields, all less than 10,000 ft. deep.

San Andres itself is now thought to be larger than originally expected. The field lies on the west flank of a north-south structure about 9 miles long and 5½ miles wide.

Peru Test Finds Oil

Second strike in big basin might flow 500 bbl. daily

EASTERN Peru's big, but little-tested Amazon basin area had its second discovery last week.

Cia. Peruana de Petroleo "El Oriente" S.A., brought in a well on the Ucayali River, near Contamana, about 93 miles north of Pucallpa. Early reports were that the well might produce as much as 500 bbl. daily.

The company is locally owned and has a joint development agreement with three West German firms: Gewerkschaft Elwerath, Hanover; Wintershall A.G., Kassel; and Deutsche Erdoel A.G., Hamburg.

The discovery well was the company's third wildcat in Peru's Amazon basin. The first two were dry holes, drilled about 20 miles to the southeast.

El Oriente has about 3,000,000 acres under concession in eastern Peru, where 17 companies hold a total of 36,000,000 acres.

Peru's only other discovery east of the Andes Mountains is Agua Caliente field, discovered in 1938. Texas Gulf Producing Co. has 80 per cent interest in the operating company, Ganso Azul Cia. de Petroleo.

The field is located about 140 miles south of the new find. Most of the 2,000-bbl. daily output of Agua Caliente is transported by a 46-mile pipeline to Pucallpa. It is then barged down the Ucayali to a refinery at Iquitos or on to Manaus refinery in Brazil.

Europe Oil Scenes Shift

● The German picture is good, but Austria's production is falling behind demand. In Italy, there's new hope of a better break for private industry.

SOME basic changes are under way in Western Europe's two biggest oil countries, West Germany and Austria.

There also were signs last week that a lesser change may be coming in Italy.

In the case of West Germany and Austria, it became clear that the domestic industries are fast taking on a new status. One is on the way up, the other down.

In Italy, the national oil corporation, Ente Nazionale Idrocarburi (E.N.I.), has been placed under a new ministry. The head of the new department is pro-private enterprise. His job is to shake some of the dust out of government-controlled industries.

Austria in decline . . . Austria's nationalized oil industry has run into trouble.

Crude production has declined since the Russians withdrew 18 months ago. It was off 7 per cent last year from the record 68,200 bbl. daily in 1955.

The Austrian Institute for Economic Research predicts that the country has passed its peak. The institute looks for further declines of at least 5 per cent per year for at least 10 years. Output would then average 43,000 bbl. daily.

Demand is rising. It is expected to increase 7 per cent per year for 10 years, when it will average 53,000 bbl. daily. Austria also must ship free-of-charge 20,000 bbl. daily to the Soviet Union for another 9 years as reparation deliveries.

Along with the loss of 29 per cent of its revenue due to the Russian deliveries, the nationalized industry has other financial troubles. Among other things, the industry subsidizes the country's milk industry to the tune of $12,000,000 per year. It also sells gas to utilities in lower Austria at a favored price in return for drilling privileges.

German refining expands . . . The drop in crude production places Austria second to West Germany for the first time. German output reached 68,100 bbl. daily, a gain of 10.7 per cent over 1955. Further gains are expected for at least 4 more years *(The Oil and Gas Journal, February 25, page 99)*.

But it is in the refining picture that the country is making the most strides.

Sparked by a rising demand for fuel oil, capacity is now expected to double within 3 years. It will grow from 310,000 bbl. to 620,000 bbl. daily.

Three-fourths of the expansion will take place in the Ruhr. New plants will largely be fed by the 320-mile Wilhelmshaven-Cologne crude pipeline.

The three largest marketers in the country all have plans for growth. Esso A.G. is building a 68,000 bbl. daily plant at Cologne. Deutsche Shell A.G. is building a 37,000 bbl. plant at Harburg. B.P. Benzin plans to build a 60,000 bbl. refinery near Cologne.

Rurhbau G.m.b.H. (Petrofina) and Mobil Oil A.G. also have building programs.

New Italian department . . . Giuseppe Togni heads the newly formed Ministry of State Participation. The department brings supervision of a vast network of government-controlled industries under one roof for the first time.

Togni got the appointment by virtue of being leader of a right-of-center group in the Christian Democratic Party. He has a reputation as a believer in private enterprise. He also is a self-made man, growing-up in Italy's marble industry.

As a key man in the government administration, Togni's appointment could mean a relatively smoother time for private companies which may enter Italy under the new oil law.

As a supervisor of E.N.I., he might be able to step up work of the government oil and gas corporation. E.N.I.'s best results have been with gas. Deliveries rose 25 per cent last year to 400,000 M.c.f. daily. But so far the corporation has found no commercial oil.

Cuba to Get Offshore Test

Cuban Stanolind Oil Co. will probably go offshore for its next Cuban test. G. J. Smith, manager of foreign exploration for the parent Pan American Petroleum Corp., said the well will be the first test of south-coastal waters.

The company has pulled out of two onshore exploratory wells which didn't find oil, but which confirmed geophysical data "remarkably well," Smith said. The two wells were drilled in Oriente province near Santiago.

Los Chivos 1 went to 5,469 ft. Ermita 1, 25 miles east of the first well, went to 2,293 ft. Smith said they were drilled to test two surface structures and to gain information on the nature and thickness of the sedimentary rock section. Cuban Stanolind has half interest in about 16 million acres in Cuba, both onshore and offshore.

Denmark Deal Made

Jersey buys Gulf's rights covering the entire country

STANDARD OIL CO. (N. J.) has taken over Gulf Oil Corp.'s concession in Denmark.

The concession covers the entire 16,576-sq.-mile country. The transfer was made when Jersey Standard acquired the stock in Gulf's Danish American Prospecting Co. (DAPCO) with government approval.

Jersey expects to have a geophysical crew in the country by mid-April. Work will begin about May 1.

Gulf had obtained a 50-year exploration and development concession in 1938. After World War II, the concession was renegotiated and the exploration termination date was extended to May 1960.

DAPCO reportedly spent $10,000,000 in exploration before it curtailed its program in 1953. The company drilled about six deep tests and numerous shallow holes with negative results. Part of the North German basin extends into northern Denmark. Some salt domes have been located in this region.

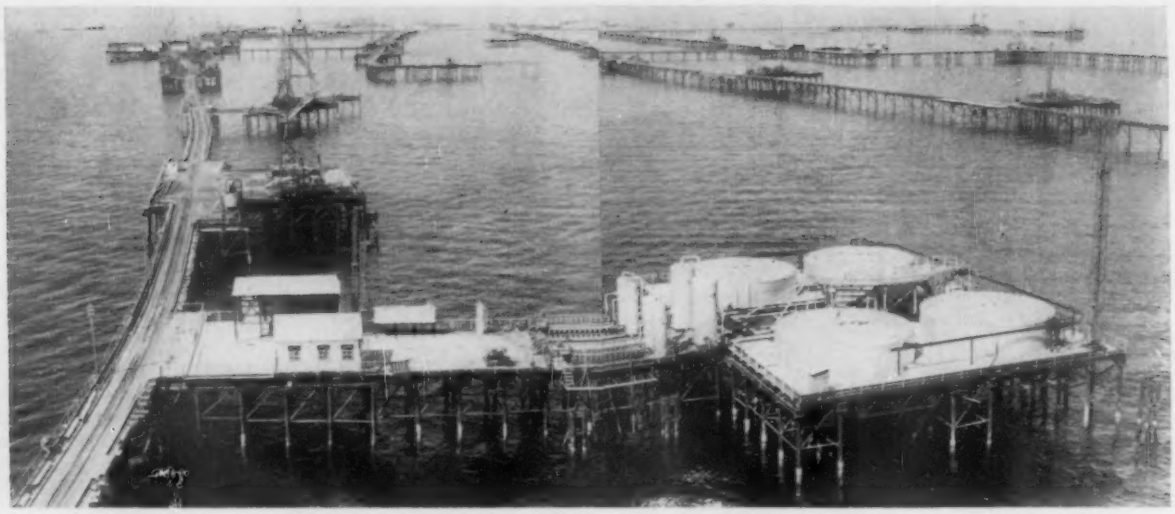
Saudi-Onassis Case Delayed

A delay of several months is in store in the 2-year-old dispute over preferential shipping rights granted by Saudi Arabia to Socrates Onassis.

This is due to the death in Cairo of Helmy Bahgat Badawi, an Egyptian and the Saudi government's representative on the three-man arbitration panel.

The dispute arose after the Saudi government and Onassis reached an agreement which would give the Greek ship owner virtual control over Saudi crude shipments. The United States, Britain, and other maritime nations protested. Arabian American Oil Co. invoked an arbitration clause in its concession agreement for the first time.

Saba Habashi, also an Egyptian, represents Aramco on the panel. The third and neutral member is Dr. Georges Sausser-Hall, a Swiss professor of international law. Final briefs in the dispute were submitted last November. The ruling of the panel had been expected in May or June.



Reds Pushing to Beef Up Dwindling Baku Output

THIS new gathering-separation unit is typical of Russian efforts to halt the rapid decline of oil production in the old Baku region on the Caspian Sea.

This overwater collection unit was commissioned by the Russians late last year in the Gyurgyanneft field offshore in the Caspian. Tass, the Russian news agency which released this photograph in the United States through Sovfoto, claims this field produced 140,000 bbl. over its quota before the end of 1956.

The rapid decline in production from onshore fields in the Baku region of Azerbaijan has been responsible for extending drilling farther and farther into the sea. Fields like this one exist on a maze of piling and overwater roadways extending farther into the shallow Caspian. This marine extension of the fields, plus accelerated secondary-recovery programs on land, is barely keeping the old Baku's production on a level.

The Azerbaijan fields at one time furnished 75 per cent of Soviet oil output. Last year that had dropped to less than 25 per cent and by 1960 Azerbaijan will probably represent only about 10 per cent of Russian production. There are more than 300 of these offshore wells and the work is being intensified. Still, Caspian production is not expected to be more than about 300,000 bbl. daily in 1960. It was more than 290,000 bbl. daily in 1955, compared to a peak of production of 425,000 bbl. daily in 1940.

World briefs

The Egyptian Government plans to form an exploration company which will acquire 61 licenses in the Eastern Desert and Red Sea area. The regions earmarked for the new company were areas on which Mobil Oil (Egypt), Inc., and Anglo-Egyptian Oilfields made applications 9 years ago.

The Norwegian Parliament has formally approved Standard Oil Co. (N. J.) plans for a 40,000-bbl. daily refinery on Oslo Fjord. This confirms an agreement made in December by the company and government administration. The plant will fill Norske Esso's needs for most products and will permit export of 25,000 bbl. daily to Sweden and Denmark.

Guatemala's first offshore exploration concession has been awarded to Central American Oil & Mining Co., owned by U. S. interests. The company received rights on 12,000 acres in the Amatique Bay area on the Caribbean Coast. The concession is the thirty-seventh to be issued by Guatemala in the past 18 months.

Shell Chemical Co. will become the second producer of polyethylene plastics in the United Kingdom when a pilot plant at Partington goes on stream this summer. The 1,000-ton per year plant will use the Ziegler process.

Imperial Chemical Industries is the only other producer at present. Union Carbide and Monsanto Chemicals will have plants in operation next year.

Are Your Customers Informed?

Do they know that crude-oil prices have gone up only twice in the past 9 years? That gasoline prices have risen far less than the average of other commodities? That oil profits are far below those of the automobile, aircraft, chemical, steel, rubber, and other industries?

The 16-page special section which begins on the opposite page was designed to answer the many charges hurled at the industry and widely publicized in recent weeks.

As a service to the industry, reprints are being prepared and will be available at nominal cost to oil companies wishing to distribute them to legislators, customers, or the general public. For price quotations on large quantities, contact:

Reader Service Department
The Oil and Gas Journal
Box 1260, Tulsa

Oil HITS BACK!

... The industry's position today as seen by the editors of The Oil and Gas Journal

With only two price increases in 9 years . . .

Just Why Is Oil Under Attack?

- PRICE GOUGING is a popular charge in Washington these days, though probably no other industry has been so effective in keeping inflation out of its prices.
- COLLUSION is another accusation. Still a third is that the selfish oil industry failed to support efforts of this country to meet the European oil emergency.
- OIL'S CRITICS grabbed headlines with their wild charges. And they have pilloried oil men by implication and innuendo. The result: Suspicion is focused on an important segment of the nation's business. The charges are easily answered with facts . . . and here are the facts.

THE American oil industry saved Europe from a disaster last winter.

Rarely in the history of business has an entire industry shifted its patterns of marketing, transport, and manufacture on a world-wide scale so quickly in an emergency.

The oil industry turned the trick without compulsion from any government authority. It even often used uneconomic and expensive methods. But Western Europe got the crude and products it needed when normal supplies were shut off from the Middle East.

Insiders in the oil industry saw trouble coming in the Middle East before the blow struck. The Oil and Gas Journal pointed out what was involved last summer when Egypt nationalized the Suez Canal. It declared if the canal should be closed, Europe could be supplied without too much trouble by sending tankers around Africa and by moving supplies from the Americas. But it warned if the Middle East pipelines also went out, full-scale emergency efforts would be required.

U. S. oil companies operating abroad immediately began mapping strategy for all contingencies. When hostilities in Egypt resulted in a blocked canal and a bombed pipeline in Syria, all American oil companies took action.

They revised tanker schedules, drew on crude stocks in the Americas, stepped up production, switched pipeline routes and expanded runs, and changed some refinery yields. They had a heavy flow of oil moving toward Europe weeks before the Government assumed a supervisory role in the crisis. When this flow showed signs of falling off, state authorities permitted oil production to be increased further. American refiners cut their use of crude, and oil moved to port from far inland areas by expensive transportation.

Small thanks . . . But the oil industry is getting no medals for its role in the emergency.

Actually it expects none, but it views the attacks being made on oil in Congress and the public print as a strange spectacle. Critics accuse the industry of:

. . . **Failing** to meet Europe's needs in the crisis.

. . . **Price gouging** by raising the price of crude oil.

. . . **Collusion** by jumping gasoline prices at a time when inventories were high and demand off due to seasonal conditions.

When the facts on oil finally caught up with the accusations, critics changed their line of attack. They concluded the oil industry actually doesn't have to fix prices. That job is being done for it by state conservation laws and by federal help through the Interstate Oil Compact and Connally Hot Oil Act. They claimed excessive profits being earned by oil companies were proof that prices are too high

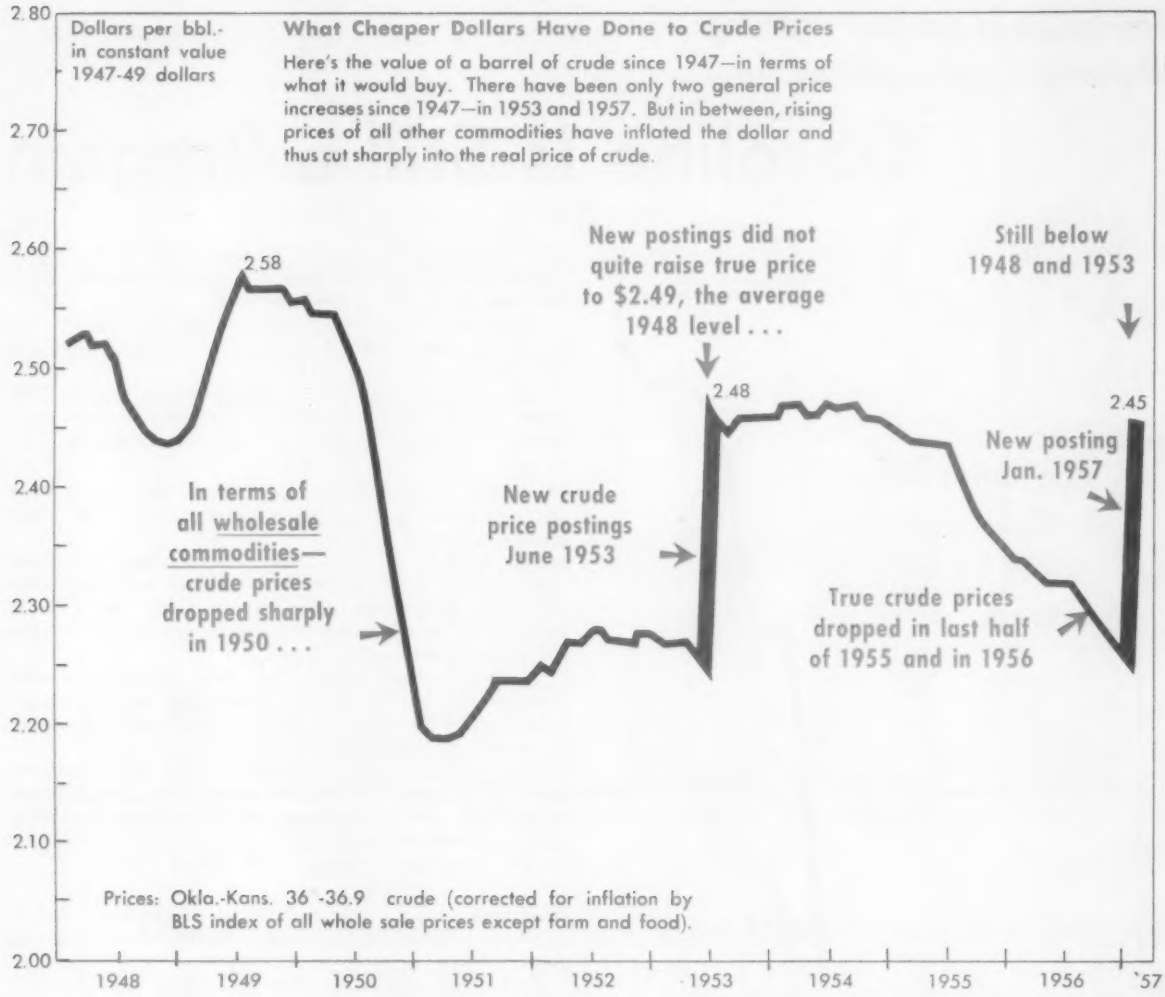
The explanation for the oil industry's slowness in defending itself is simple. The industry has no single spokesman. Replies finally came from individuals, single companies, trade associations, and writers who follow trends in the industry. This motley defense in itself is evidence there's no effective monopoly operating in the industry.

What's the answer . . . The charge that oil failed to meet its obligations in the crisis is fast falling apart now with prospects of nearly normal oil movements through Suez and the Syrian pipeline by midyear.

This one fact stands out: The oil industry delivered more supplies to Western Europe than our diplomats promised those countries they could expect. Even Government officials now are defending oil on this score. They declare the industry did an excellent job—even more than was expected.

But the excitement being stirred up over the crude-price hikes is another matter. And the charge of price gouging rankles.

The industry has come far since the early days of the so-called "oil barons." Smart businessmen with a public awareness are in command. They have enlisted scientists in great numbers to solve their problems. They pay the best industrial wages in the nation, have the most generous program of fringe benefits, and give financial support to numerous civic, charitable and educational projects. A


What Cheaper Dollars Have Done to Crude Prices
Here's the value of a barrel of crude since 1947—in terms of what it would buy. There have been only two general price increases since 1947—in 1953 and 1957. But in between, rising prices of all other commodities have inflated the dollar and thus cut sharply into the real price of crude.
Dollars per bbl.- in constant value 1947-49 dollars
2.80
2.70
2.60
2.50
2.40
2.30
2.20
2.10
2.00
2.58
In terms of all wholesale commodities— crude prices dropped sharply in 1950 . . .
New crude price postings June 1953
New postings did not quite raise true price to $2.49, the average 1948 level . . .
2.48
Still below 1948 and 1953
2.45
New posting Jan. 1957
True crude prices dropped in last half of 1955 and in 1956
Prices: Okla.-Kans. 36 -36.9 crude (corrected for inflation by BLS index of all whole sale prices except farm and food).
1948
1949
1950
1951
1952
1953
1954
1955
1956
'57

gouging charge strikes at the heart of the industry's relations with motorists, homeowners, and industries who buy a vast array of petroleum products.

Oil prices have advanced only twice since the end of the year 1947. What other commodity in popular demand can claim such a record? In relation to the wholesale price of other commodities oil has always ranked below average.

The graph at the top of this page shows this relationship. The higher price postings for crude made in 1953 failed to bring oil's true price up to its 1948 level. Higher prices in January 1957 didn't regain the ground oil lost since 1953.

During those years, steel, autos, building and construction, labor—in fact nearly everything—posted steadily higher prices.

Special protection . . . On the basis of its own rising costs, oil industry prices are still too low. They're low also in comparison with other industries.

The detailed story on costs is told later on these pages. It's sufficient to point out here that the industry's costs of finding, producing, and refining oil are up at least 50 per cent since 1948. The higher prices the industry has received in that time won't cover these extra costs.

What of special protection for oil then? If these state and federal conservation statutes give oil such an economic advantage, why haven't oil prices been jacked up at every turn during this inflationary era? They've gone up only twice.

Critics of the industry immediately retort that foreign imports are the reason domestic prices haven't shot sky high. And these same critics allege the international oil companies have conspired to form a world-wide oil monopoly.

If this actually were true, it would be a simple matter to move world oil prices up to a point at least where they would cover increasing domestic costs. A world oil monopoly would have no trouble raising both U. S. prices and world prices. If such a monopoly exists, it must be the most inefficient one in history. At least it can't juggle prices at will.

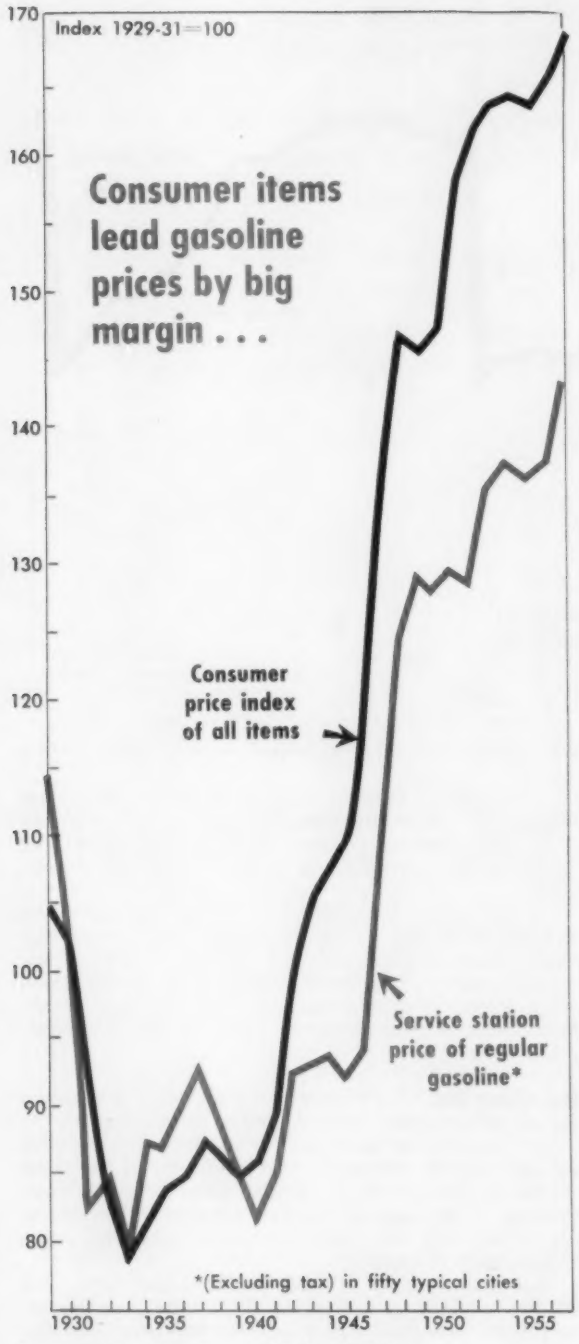
Old money bags . . . When critics really want to condemn the oil industry, they claim oil profits are too high.

But these people never tell the whole story. Oil profits are not too high. Earnings of oil companies on net assets are less than many other comparable industrial corporations. Earnings for the industry based on assets have been declining, in fact, while other industries have enjoyed good jumps in their rates of earnings.

For the full story of these profits, prices, costs, and what the oil industry is doing please turn the page. Editors of The Oil and Gas Journal have set forth the following brief in oil's defense.

The price is up, but nothing like other commodities, so . . .

Gasoline Is Still a Bargain



Consumer prices from Bureau of Labor Statistics.

IF American motorists could get their hands on a constant dollar to spend, they'd find this: Gasoline actually costs less than it did during the depression.

Expressed in constant dollars—ones that always buy the same—gasoline is 19 cents today compared with 20-22½ cents in 1930-31.

Of course, no one spends constant dollars. But the "old green" that is being spent will get the motorist more gasoline for his money than nearly any other consumer item.

The index . . . Statisticians report that in the postwar price merry-go-round, gasoline has never caught up with other consumer items.

When World War II ended, gasoline prices were lower than the index averages for 1929-31. They were 92.3 while the index number for all consumer goods was 110. In January of this year, gasoline had moved to 143.3 while all consumer items stood at 168.7.

Very few people care a flip about indexes. But what these show is that the price of regular gasoline at the service station in 50 typical U. S. cities has risen less than all the other every-day purchases the motorist makes.

The average factory worker can take an hour's pay and buy 9 gal. of gasoline today, excluding taxes. He could get only 8.3 gal. for an hour's pay in 1953. Even considering taxes, which have risen, the hour's pay today will buy 6.6 gal. of gasoline compared with 6.2 in 1953.

What goes on . . . The true picture of gasoline prices is shown graphically in the chart at the top of the opposite page.

The retail price of gasoline since 1948 shows a 16.2 per cent gain.

That's lower than the gains for other goods. Take a few: Milk is up 19.5 per cent. Bread up 34.4 per cent. Rents up 35.8 per cent. Medical care up 37.2 per cent. And coffee up 103.4 per cent.

Something to ponder . . . Motorists looking at their higher gasoline bills forget two important differences these days:

. . . Their modern cars use more gasoline.

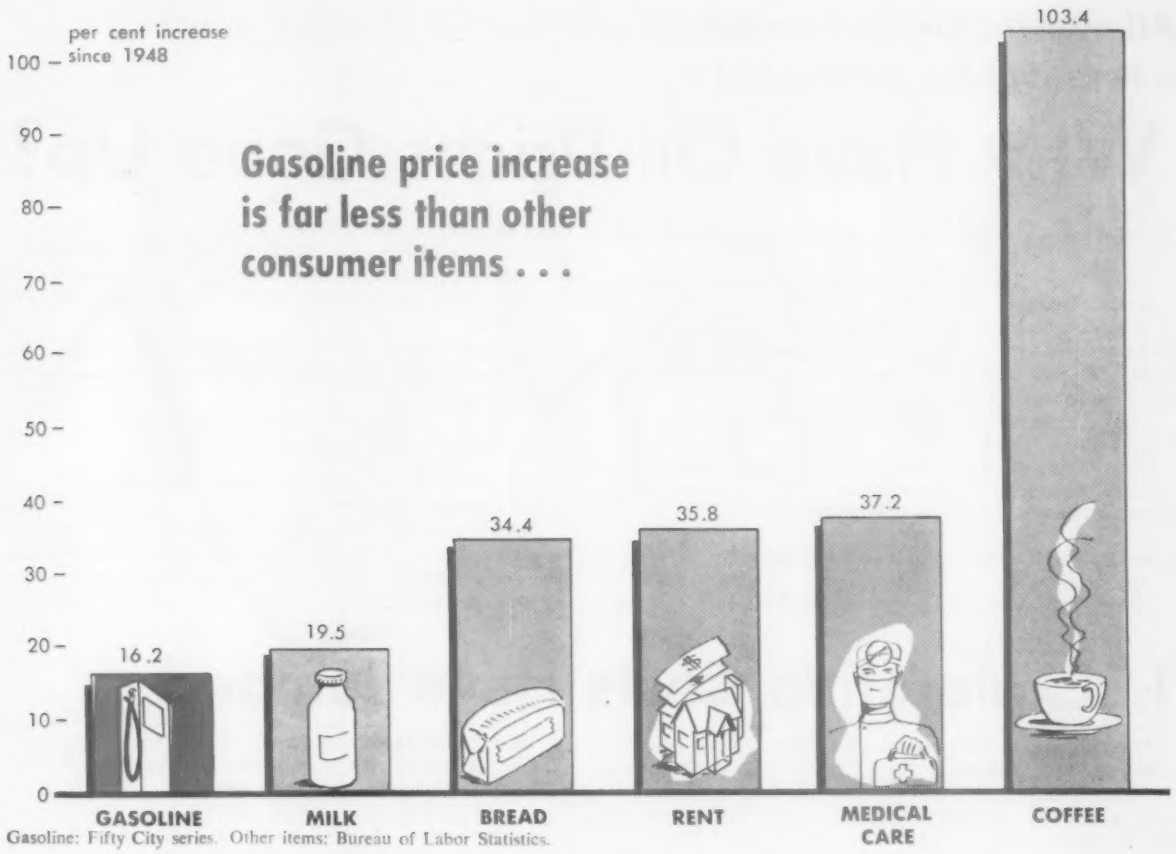
. . . The gasoline itself is a much better product.

Today's cars with automatic transmissions, power equipment, and engines of high compression and tremendous horsepower don't get the mileage enjoyed by most of yesterday's autos. This is compounded by heavy traffic in most metropolitan areas.

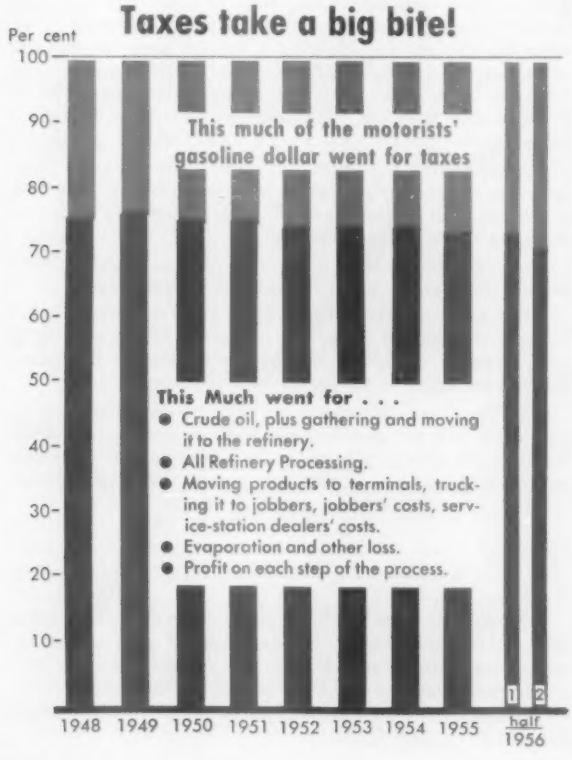
Today's gasoline is 10 octane numbers higher than 10 years ago and even much better than the brand sold before the war. If the motorist were buying the same gasoline he did 10 years ago, the cost would be much lower. But he would go daffy trying to drive his family car.

Modern cars require the better gasolines. And that quality has been built into the fuels at tremendous extra expense by the American refiner. He has to put in expensive new equipment every few years to boost gasoline octanes. And often the motorist doesn't pay a cent more.

At that, the words "Fill 'er up" given at the service station are still the beginning of a bargain for the motorist.



Gasoline: Fifty City series. Other items: Bureau of Labor Statistics.


Taxes take a big bite!
Per cent
100
90
80
70
60
50
40
30
20
10
This much of the motorists' gasoline dollar went for taxes
This Much went for . . .
● Crude oil, plus gathering and moving it to the refinery.
● All Refinery Processing.
● Moving products to terminals, trucking it to jobbers, jobbers' costs, service-station dealers' costs.
● Evaporation and other loss.
● Profit on each step of the process.
1948 1949 1950 1951 1952 1953 1954 1955
1 2
half 1956

. . . And More Taxes Are Coming

"TAXES" is becoming an ugly word. But it's hard to discuss gasoline prices without gently pointing out that federal and state tax gatherers have their hands in the motorists' pockets too.

And like everything else, taxes are rising. When they'll stop no one knows.

In 1948, taxes took 24.6 cents of every $1 spent over the nation for gasoline. This had increased to 26.3 cents by 1955 and in 1956 it took a double jump. During the first half of the year, the tax share of the gasoline dollar was 26.6 cents and moved to 28.8 cents during the last half year.

The motorist gives 71.2 cents of his gasoline dollar to the oil industry.

More taxes . . . The prospect is there'll be more taxes on gasoline.

One explanation for last year's sharp jump in gasoline taxes is the federal levy to finance a nationwide network of superhighways. Officials in Washington already are saying the tax isn't enough and should be increased to meet higher costs in highway building.

Many states already have made gasoline-tax increases this year. Legislatures in Maryland and Indiana have voted a 2-cent per gallon tax increase. And 1-cent hikes have passed in Arizona, Arkansas, Nebraska, New Hampshire, North Dakota, Ohio, Utah, and Wyoming.

The governors of New Jersey and New York have recommended 1-cent per gallon tax increases, and Vermont's governor has asked for a 2½-cent hike.

All over the nation there's been a howl, but few have asked . . .

Why Have Oil Prices Gone Up?

THE price of crude oil went up for just one reason: Higher costs.

That's the same story for the prices of gasoline, fuel oil, and other products refined from crude oil.

Unusual demand created by blocking the normal flow of Middle East oil to Europe merely speeded up the inevitable. Oil men had been warning the nation for months before Suez that the price of crude must rise.

An increase would have come much earlier, but cheap foreign crude being imported into this country made it unlikely a price hike would stick. When the Suez crisis reduced the burden of foreign crude, domestic prices under pressure of costs had no place to go but up.

Costs up—how much? . . . Everyone, naturally, is weary of rising costs.

They've been going up everywhere for years now. It takes no great mental exertion to realize rising costs don't hurt an industry if income through prices keeps up. But let an industry's prices lag behind costs, and there's trouble.

That's what has happened to oil. Consider the trend of these costs:

. . . **Exploration**—doubled and tripled since 1948.

. . . **Drilling and production**—in the neighborhood of 60 per cent higher.

. . . **Refining**—slightly more than 50 per cent.

Meanwhile, prices in the oil industry show:

. . . **Crude oil**—only 19.5 per cent higher since 1948.

. . . **Gasoline**—14.5 per cent higher.

Very few other industries have absorbed such a spread between prices and costs and still kept solvent. The detailed story of how the oil industry has managed it makes interesting reading.

1. Exploration Costs Have Jumped

Searching for buried oil treasure is getting more complicated and expensive every day.

One leading oil explorer warned not long ago that the cost of finding oil in the United States may equal value of the oil found within 10 years. He had in mind the many factors that are pressing exploration costs upward and the inability of the industry generally to recapture costs through higher pricing.

Let's take a look at these various costs. They show clearly what the oil man is up against.

Men still important . . . The oil industry relies on a lot of brainpower. And the cost of brains is going up too.

Scientifically-trained geologists and geophysicists schooled in the structure and characteristics of the earth have been called into play. They now tell the oil man the likely places to drill—but only after tedious, complicated, and expensive study of the proposed region.

These men have bachelor's degrees; many have master's and doctorates. Today's starting pay for these geologists and geophysicists with a bachelor's degree is 2½ times the 1945 starting salary.

At the same time, wages of less skilled workers in the field crews on geological and geophysical surveys also are higher. The average has nearly doubled since the war.

But oddly, the cost of a basic seismic crew has risen less than many of the other costs in geophysical and geological exploration. In the Mid-Continent area, a basic 12-man seismic crew can be hired today for $10,000 to $12,000 per month depending on terms of the contract. In 1945 the same crew cost $8,000 monthly.

Other factors, however, have tripled exploration costs per crew month in the last 12 years.

The machines . . . The price of scientific equipment and ordinary supplies needed for oil exploration is one major reason oil-hunting costs have skyrocketed.

New development in equipment is another factor. New machines often displace older ones before they even are depreciated.

These geophysical costs are accentuated by present practices which often call for using more instruments, drilling more shot wells, and making more shots.

Permit to shoot . . . Cost of permits or "damages" for operating on a ranch or farm is another big item.

One company reports in 1947 its permitting costs for a West Texas area ran around $100 monthly. By 1956, this monthly average had hit $8,000. Some ranchers in 1945 made no charges for allowing a seismic crew to make a survey of their land. The same ranchers today may charge from $25 to $50 per shot hole. Actually charges of $5 to $10 per shot hole are more common. But even then they jump the cost per crew by $1,000 to $2,000 per month.

Crews also are working in more difficult areas than formerly. A geophysical crew working offshore will cost five times what a land crew will cost. Geography even can triple the cost of a land crew.

One geophysical contractor gives these cost comparisons on two active areas: South Louisiana and West Texas.

On similar specifications, a basic portable seismic party in South Louisiana will cost the user about 10 per cent more today than in 1947. But the "extras" added to this party will run the costs to 50 per cent higher than in 1947.

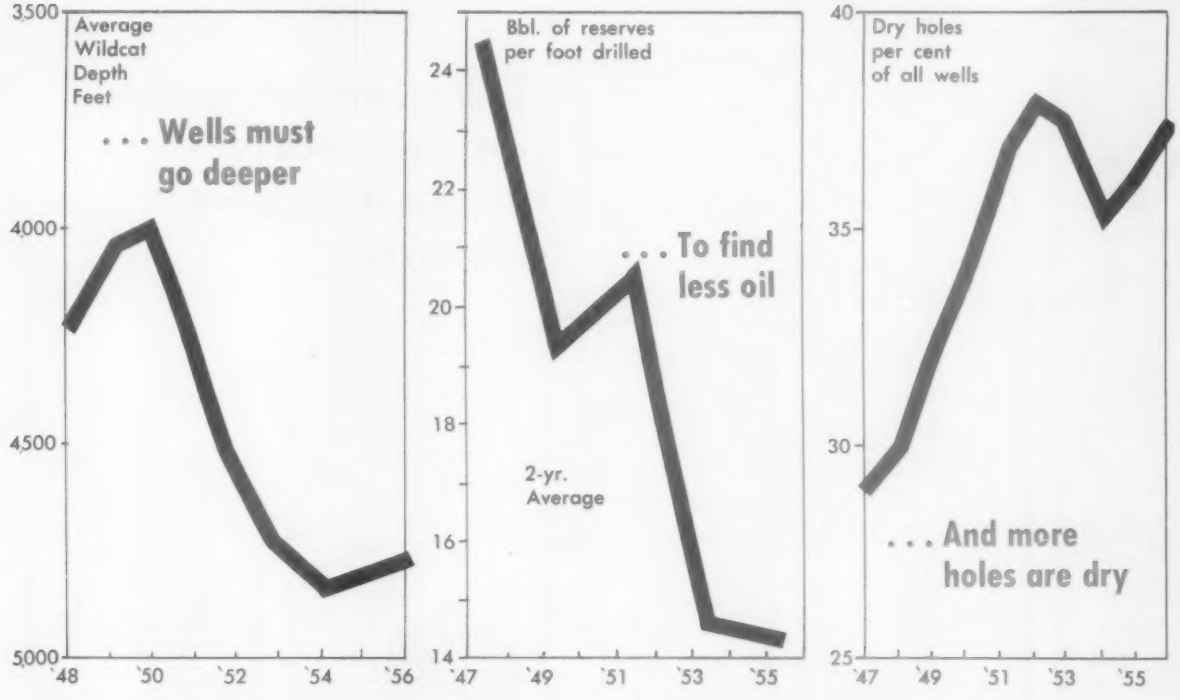
In West Texas the increased costs of operating a crew are nearer 250 per cent because work is leading into difficult areas. A crew could operate in that region 10 years ago for $15,000 monthly. Costs now are in the neighborhood of $45,000 to $60,000.

Any luck? . . . If oil hunters were finding colossal oil pools, these costs wouldn't hurt. But finding oil isn't coming easy anymore.

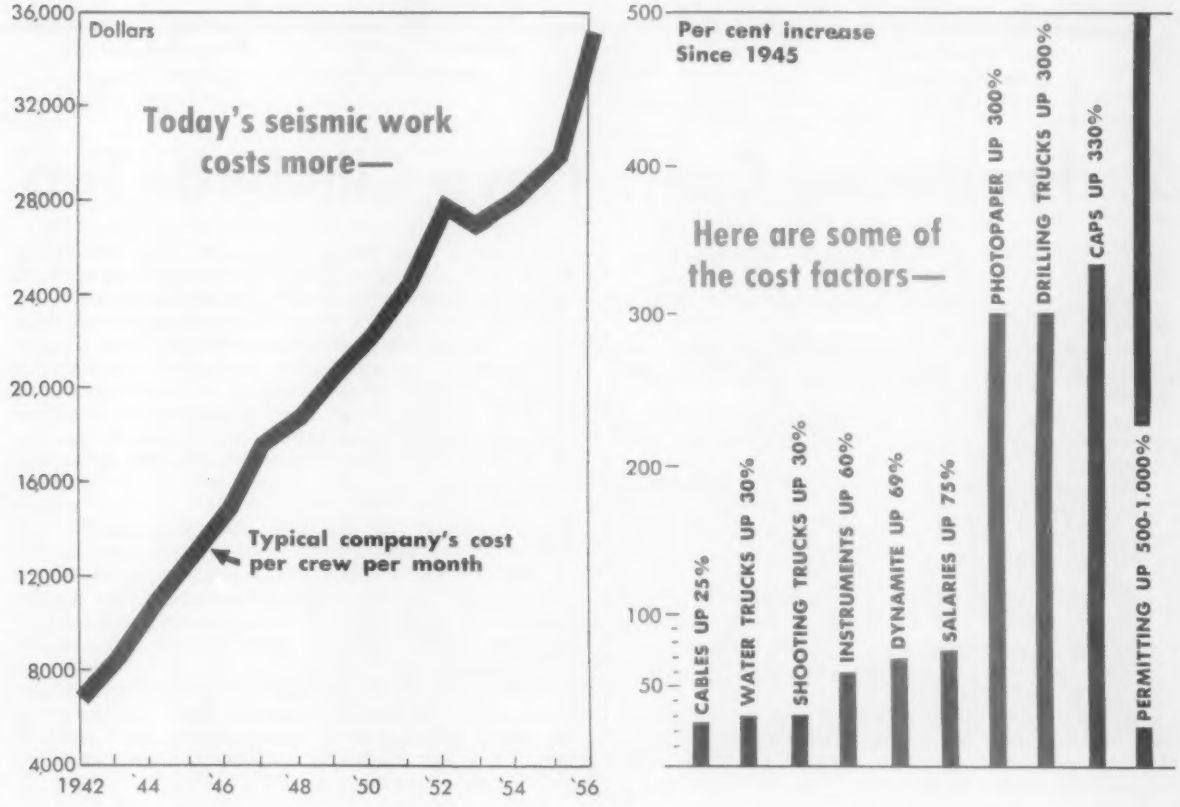
The success ratio has been going down dangerously for the last 10 years. During the peak postwar years, the average oil well proved up 168,200 bbl. of new reserves. The average successful oil well now finds only about 127,000 bbl.

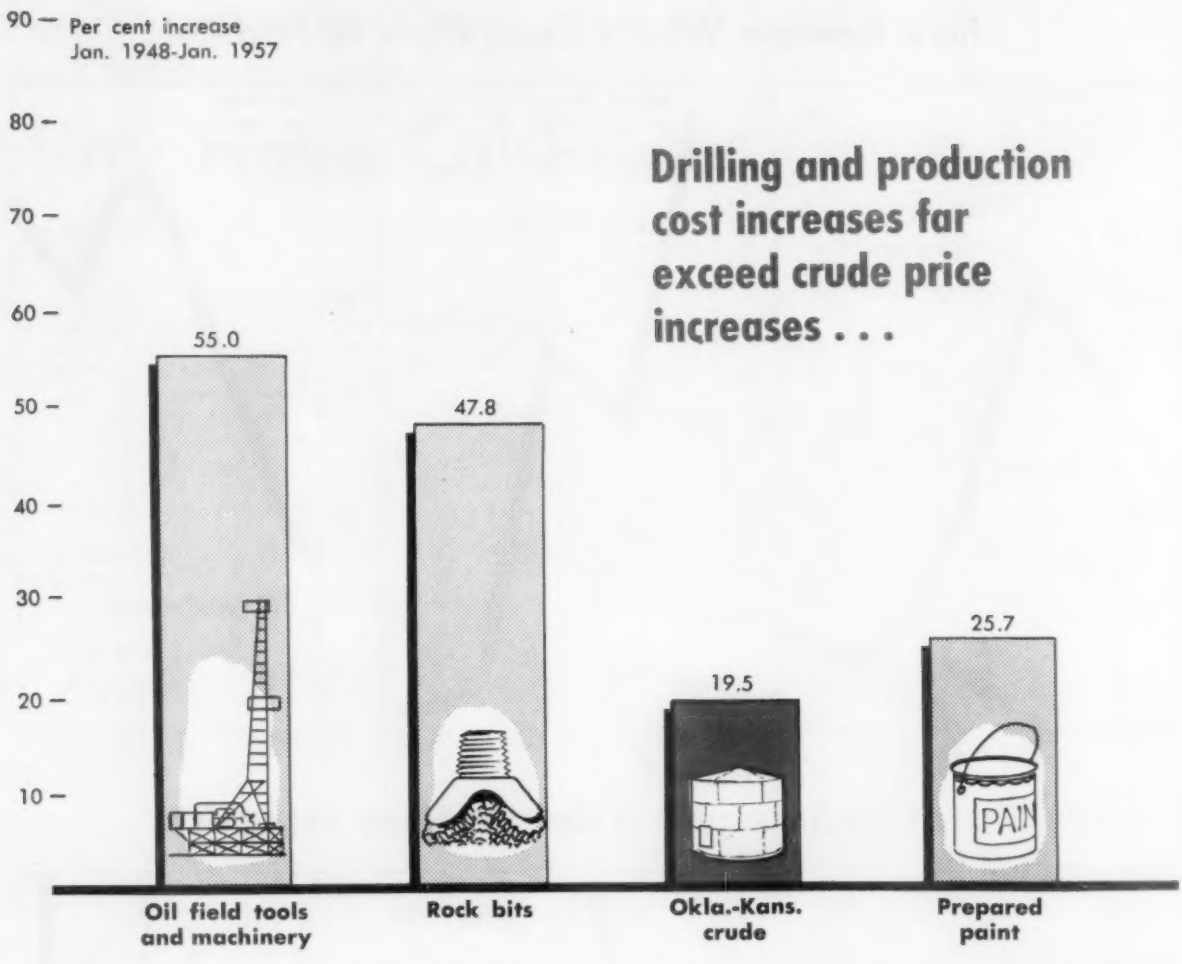
It means finding oil is daily becoming a more expensive gamble.

Three Reasons Why It Costs More to Find Oil



Search for Structures is Getting More Expensive





2. Producing Costs Have Climbed, Too

SCIENTISTS are trying hard, but so far they haven't taken the gamble out of the oil business. What they've achieved is the ability to quote the oil man a better set of odds on finding oil.

Meanwhile oil men have seen their "game" turned into a blue-chip affair with the antes getting bigger and the pots slimmer.

For example, drilling and production activities this year will require an investment of $3.6 billion. That's $600 million more than in 1956.

This money is expected to buy 60,057 wells which will require drilling 242,796,000 ft. of hole. It will pay for bringing 2.76 billion barrels of oil from the ground and adding many more million barrels to the nation's stockpile for later use.

Just how much oil will be added to reserves is difficult to estimate. But last year the industry spent $3 billion in drilling and production. It bought 58,160 wells, financed 2.5 billion barrels of production, and added to reserves 1,187 million barrels of crude.

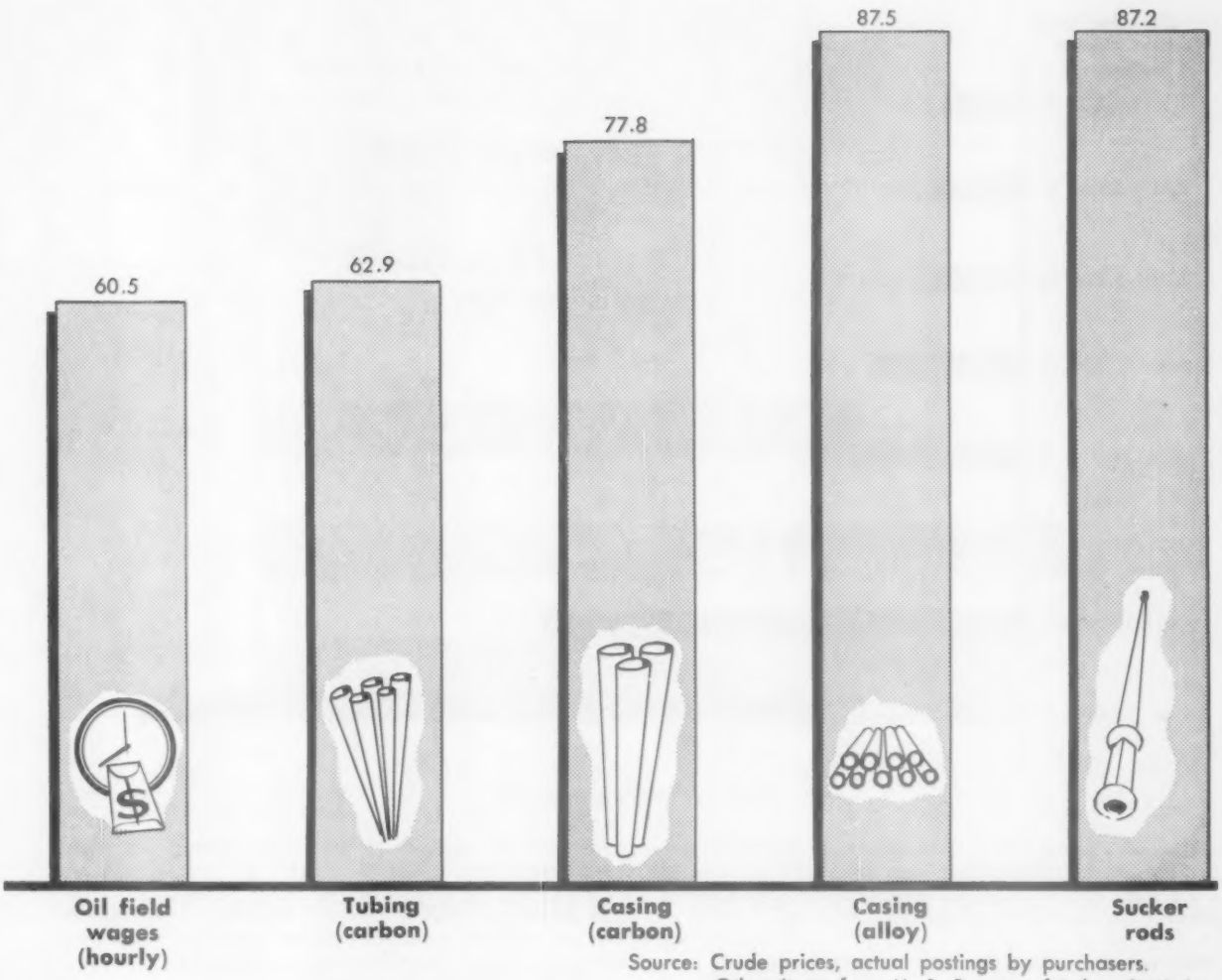
Bulk of these new reserves resulted from oil men discovering they had more oil in older fields than they thought. This happened when new wells extended producing fields and gave operators a better idea of the size of the underground pools. Other factors were new ways of making the wells produce better and new methods of recovering oil which was thought to be locked underground forever.

Only a small part of the new reserves came from wildcat activity which is the most expensive section of the business, and the most risky. Last year 13,034 wildcats were drilled. There'll be 13,645 drilled this year. If their success ratio runs true to form, 84 per cent of them will be dry. Only 12.4 per cent will find oil and 3.6 per cent will hit gas. The sad fact, however, is the oil fields the wildcats do find are getting smaller.

Who's gambling? . . . One little understood aspect of this gamble is this: It's being taken mostly by small operators.

The 30 large oil companies operating in the United States last year drilled only 23.2 per cent of the wells. Smaller independents drilled 76.8 per cent. The independents gambled even heavier on wildcats. They drilled 82.8 per cent of these ventures.

These independents risked not only their money, but also the savings of thousands of investors from every section of the nation. They spread the money around, too, among 27 states. Only four states of the 31 that have oil production recorded no wildcatting.



Source: Crude prices, actual postings by purchasers. Other items from U. S. Bureau of Labor Statistics

What's happening . . . The independent historically has played this role as the oil industry's wildcatter. But how much longer this will be true is an open question.

The trends of the past few years are putting him in a squeeze along with the major companies. Costs are going up steadily. Depths of wells also are increasing. Besides, the lure of oil is directing activities into difficult drilling areas. These are giving an upward shove to the capital investment required.

The oil man's problem becomes clearer when the other side of the coin is examined. He's finding less oil with each well. And the price for the oil he does find is lagging far behind costs. The returns are becoming mighty small for the great risks he must take.

But his real dilemma is this: He can't quit hunting for new oil very long and stay in business.

Every day that his producing wells deliver oil puts the operator that much nearer out of business. His capital assets are constantly being depleted.

That's one reason for the controversial depletion allowance. It recognizes the peculiar fact of the oil business: That the oil man is constantly depleting his capital and should be allowed to recover some of its value before the tax rates on income apply.

Everything costs more . . . The attacks on the oil industry's recent crude price increases are more baffling when the oil man's cost and drilling problems are examined closely.

One of the oil industry's biggest requirements is steel. The industry needs about 2,400,000 tons of steel annually for casing, tubing, and drill pipe and another 3,200,000 tons for line pipe. In addition, untold tons go into plates, bars, rods, and wire needed in drilling, production, and refining. The average oil well requires 50 tons of steel to drill and the average deep well 80 tons.

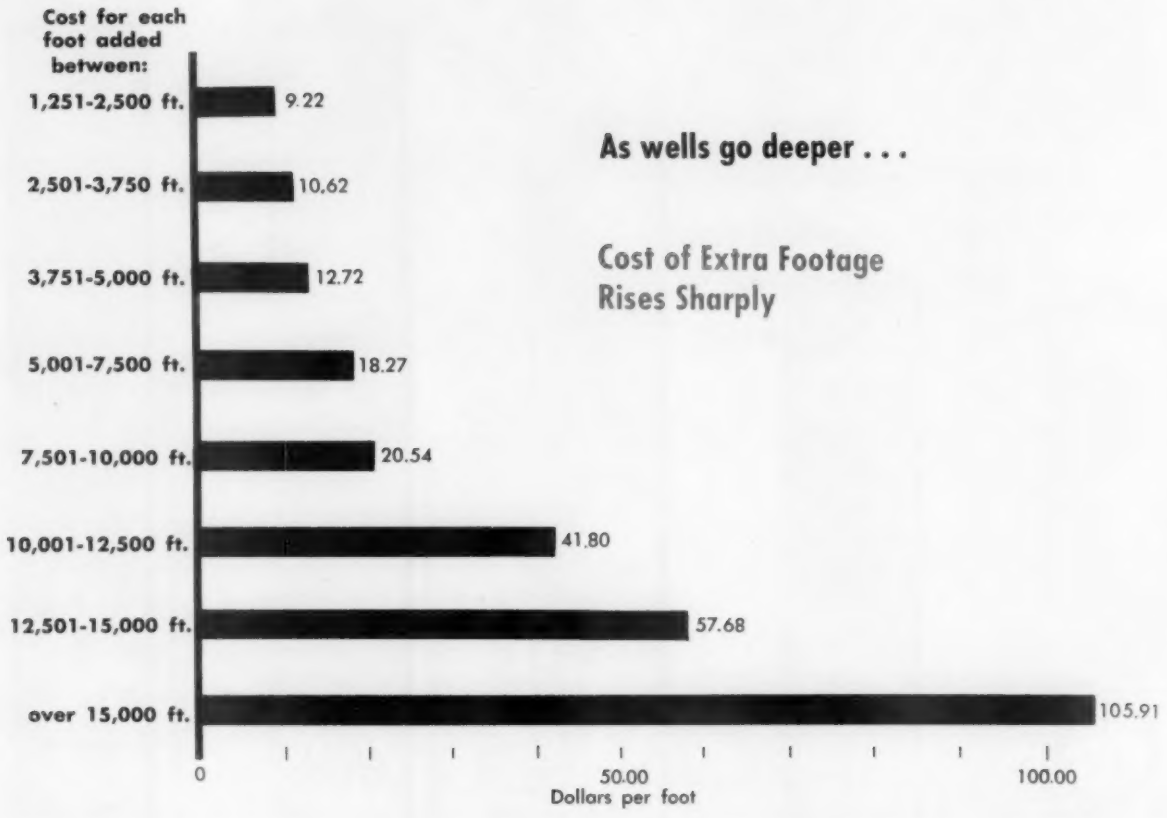
These needs easily explain why the oil man is immediately interested at any change in steel prices—and they've been changing plenty in recent years, always up.

The latest increase in oil-country steel prices came last month. It sent prices up 3.5 per cent, averaging about $7 a ton and costing the oil industry at least $40 million a year. This increase came a few months after another increase which sent the industry's bill up another $75 million a year.

The price of just one item—J-55 steel casing for new wells—shows what the oil industry faces. In May 1953, the casing cost $154.65 a ton. The price has been raised five times since then, increasing by 28 per cent to $198.25 a ton today.

From 1947 through 1956 iron and steel prices rose 63.3 per cent, metal and metal products 52.4 per cent, and machinery and motive products 43.5 per cent. In fact, the principal cost items in oil-producing operations went up from 40 to 60 per cent.

Wages also have gone up. Pay for oil-field workers has



shot up 60.5 per cent since 1948 and 14 per cent in the last 3 years. The industry granted wage hikes of 4 per cent in 1953, 4 per cent in 1955, and 6 per cent in 1956. Another round of pay increases is coming up this spring.

That's not all . . . The oil industry has weathered other cost problems besides those involving materials and labor. These arise from factors:

. . . **Increasing depth** of new wells.

. . . **Increasing proportion** of dry holes.

. . . **Rising volume of work** in expensive areas.

The trend toward deeper wells is shown by these figures: Average depth of all wells drilled rose from 3,321 ft. in 1946 to 4,022 ft. in 1956. Average depth of wildcats went from 4,245 ft. in 1948 to 4,759 ft. last year.

While the ratio of dry holes to producers among wildcats has fluctuated from year to year, the trend in the last 10 years has been unfavorable. The dry holes totaled 79.7 per cent of all wildcats in 1947 and reached 84 per cent last year.

The natural result of the rise in number of dry holes is discovery of less oil per well drilled. This means oil operators must drill more wells to stand a chance of finding the same amount of oil.

That's what is happening and the trend is expected to continue through 1960 when discoveries per well will drop to 99,000 bbl. They averaged 127,000 bbl. per well in 1955. Although this average was higher than the year before, it was still lower than all but 3 other years since 1940.

Hard diggings . . . A big oil discovery at shallow depths in easy drilling country would solve many problems for the oil industry. But things just aren't coming that easy these days.

The oil search is leading offshore, into deeper and deeper water. It's going to the mountains and high plateaus of the West where oil-pay horizons are deeper and lie under hard crusts of earth; to the Gulf Coast where deep, high gas pressures pose a danger.

The payoff . . . The only way the oil man can pay his increased costs and have anything left for a profit and for future drilling is to get a fair price for his crude.

Here's the oil man's price story:

Since 1947, there have been only two general increases in crude oil prices. A 25-cent rise in 1953 and another of about 30 cents this year put the price to $3.07 per bbl. That is 55 cents a barrel or 19 per cent higher than 10 years ago. The wholesale price index for both crude and refined products after the recent price increases only stood 29 per cent higher than in 1947-49.

His price increases never catch up with costs. The 25-cent per barrel increase posted in 1953 did not cover the extra costs since 1948. And since 1953 his costs rose another 50 cents a barrel, but the oil man could only manage to get an average 30-cent increase.

Go for broke? . . . Critics of the industry ask: How can oil companies show such fat profits then if their prices are too low?

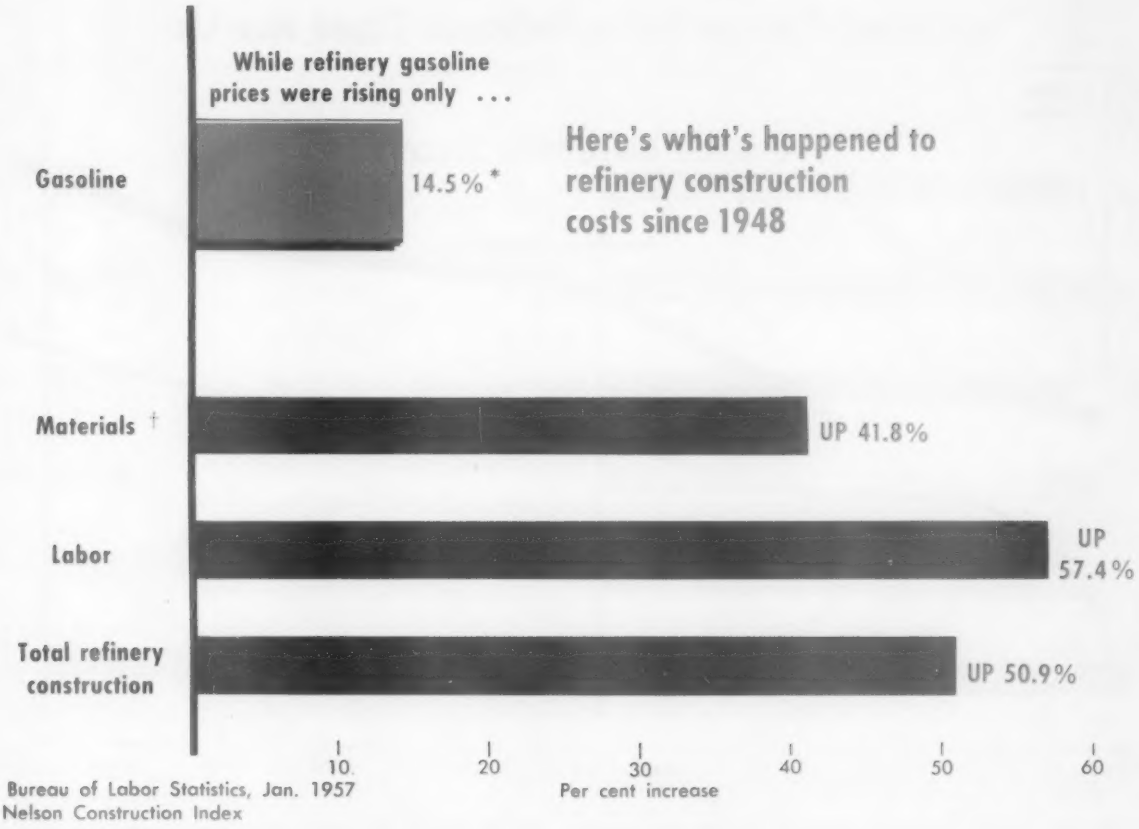
Fat profits are a misconception.

Most people confuse oil companies that operate only in the U.S. and those that have substantial income from foreign operations. The operations abroad, in many instances, are paying handsome returns. But the rate of returns on investments in domestic petroleum operations have been sliding for the past 10 years. And for the last 5 years the rate of return for leading petroleum companies—both those with domestic and with foreign operations—has fallen.

The only reason profits haven't shrunk more is due to:

. . . **Constant improvement** in oil technology.

. . . **Investment in more efficient** equipment.



3. Costs of Refining Have Soared

REFINERIES go out of date nearly as quickly as ladies' hats.

That fact alone makes refining a high-investment business. It's rated at the top for American industry in average investment required in equipment and tools per worker.

Few motorists buying gasoline at the service-station pump realize the frantic rat-race their refiners have been running since World War II to:

. . . **Increase plant capacity** to handle more crude and make more gasoline.

. . . **Keep a capacity margin** above actual needs for defense purposes.

. . . **Keep processes up-to-date** to turn out ever-higher quality products.

Historically refining equipment is rarely depreciated entirely. It is constantly being improved, enlarged, maintained.

Walk through nearly any refinery, and this is apparent. Some piece of equipment 10 or 15 years old is tied into a shiny new unit, changed to do a different job than the one it originally performed.

This trend of constant improvement and expansion shows no sign of slacking off. Refiners know they can't operate the same plant for any long period without change and stay in business.

Every time the automobile designers in Detroit come up with a change in engines, the refiners have to move with them. If the airplane makers switch from motor-driven propellers to jet engines, the refiners must be ready.

In each case, the refiner has to go two ways at once. He makes the new fuel. He still has to supply the old until the autos or airplanes requiring it are junked or no longer made. Then he faces the job of doing something with his out-dated equipment.

The capacity problem . . . That's the general nature of the refiner's business. Let's take a quick look at his specific problems.

His basic problem is keeping a plant large enough to meet demands in his marketing area. Since the war, he has been encouraged by the Government to keep plant capacity even larger than needed. His extra capacity is wanted by defense authorities as a cushion in case of an emergency. Then refiners could kick up production quickly to supply our armed forces and those of our allies.

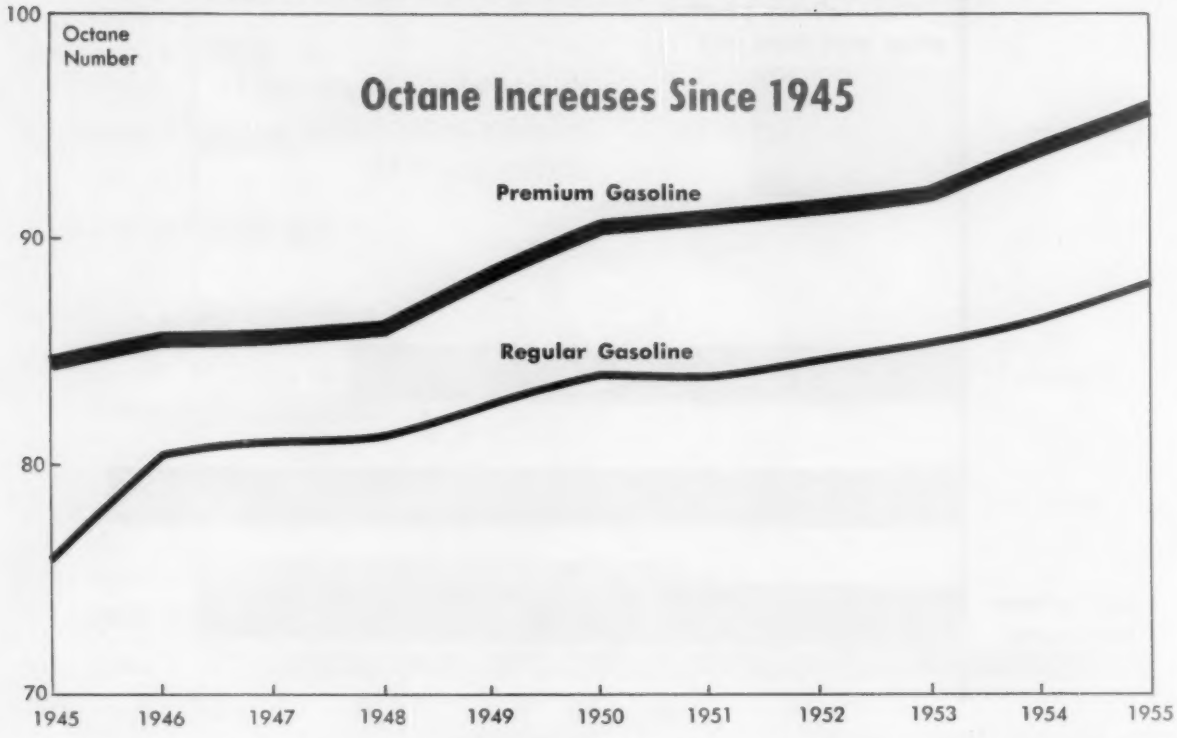
In order to do this, the refining industry is spending hundreds of millions of dollars this year alone in new plant facilities. And it has done so every year since the war.

As a result, refiners have built up plants capable of processing 9½ million barrels of crude daily in 1957. But they are expected actually to need only 8.1 million barrels daily of capacity this year.

The capacity, needed only for defense, not only is expensive to build but it complicates the refiner's marketing problem. The excess makes it too tempting to overproduce, flood the market with products, and depress prices. Often that's exactly what happens.

The quality story . . . The more costly side of the refinery picture involves product quality.

Biggest Reason Why Refiners' Costs Are Up



Quality to the motorist primarily means motor-fuel octanes. They have climbed gradually more than 10 octane numbers since 1948. But that's not the whole story.

Home-heating oil, for instance, is vastly improved with chemicals to burn cleaner. Diesel and jet fuel now require costly refining. Even lubricating oils are vastly improved. They are made now not only to lubricate engine bearings but also to prevent corrosion, clean the engine, and even cool it.

This built-in quality has forced refiners to install a host of new process units. None of them add much to his income because they don't increase his ability to make more products. In fact some of them have sliced his production volume.

Look at a few of these processes:

. . . **Catalytic cracking.** Some 265,000 bbl. daily capacity was added last year primarily to break down the less desirable parts of crude oil into ones more valuable for high-octane gasoline.

. . . **Catalytic reforming.** Only a few units for making wartime aviation gas were available in 1948. Now capacity is 1,240,000 bbl. daily.

. . . **Catalytic hydrogen treating.** This method of stripping sulfur and nitrogen from products to improve quality has jumped from nothing to 800,000 bbl. daily of capacity within 3 years.

. . . **Alkylation.** It was a big component of wartime aviation gasoline and has been expanded to 275,000 bbl. daily capacity now with gasoline approaching the 100-octane range.

What's the cost? . . . All this building activity in U. S. refineries has been at a price.

New refining capacity added last year cost refiners nearly $450 million. This includes the process units themselves plus other facilities needed to keep them operating. Of this added investment, more than 65 per cent was for quality improvement alone.

The pace is getting faster this year. The Oil and Gas Journal's annual refining survey reports new crude capacity on the construction books will total nearly 600,000 bbl. daily. The money outlay will hit $650 million. Again, probably 70 to 75 per cent will go into processes designed to make higher quality products—and not one more barrel of products. In fact, net yield per barrel of crude is shrinking as the octanes rise.

That's not the only squeeze the refiner is facing. Naturally, he has built these processes on rising costs. His refinery construction costs have gone up 50.9 per cent since 1948. Refinery wages since 1948 have risen 49.9 per cent. Crude prices have gone up about 19.5 per cent. But the wholesale price of gasoline is only up 14.5 per cent since 1948.

But the octanes themselves come high. Last year the octane rating of premium gasoline rose 1.2 numbers. Regular grade went up 1.3 numbers. Consensus of refiners is that this small increase cost the industry $155 million. They expect a similar increase this year to cost $175 million. These costs are merely the required ante to keep motorists satisfied with higher compression cars.

How do they do it? . . . A few precarious factors make it possible for the refiner to stay in business under these conditions. They are the refiner's:

. . . **Increased efficiency.**

. . . **Use of many petroleum byproducts** in the new petrochemical industry.

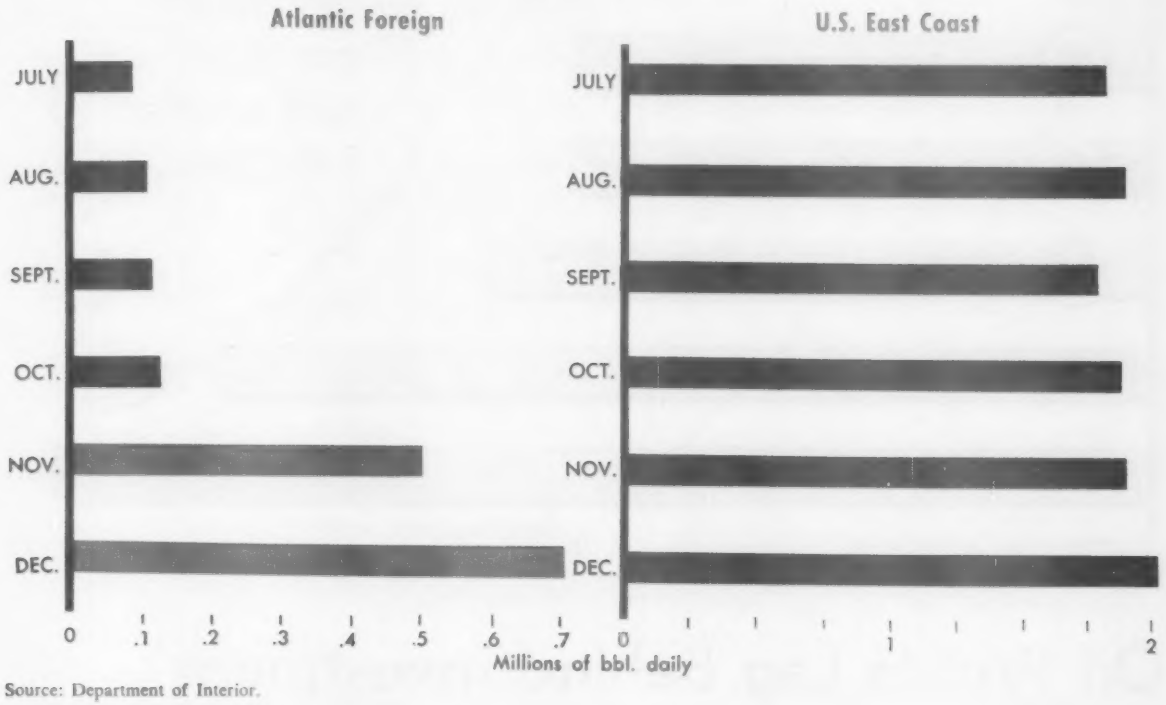
. . . **Use of larger processing units** where big production offsets much of the added costs for high octane.

. . . **Rising demand** for products.

If any of these factors start going sour and the refiner can't step up his prices, he's in trouble.

How Suez Jumped Demand on the Gulf Coast

Tanker shipments from the Gulf to:



Source: Department of Interior.

Suez Just Sparked the Overdue Hike

THE scramble for crude oil on the Gulf Coast by buyers for refineries shut off from the Middle East is what caused the price to rise at the time it did.

Tanker shipments zoomed (chart). Stocks of crude in storage went down steadily. Buying agents for both European and U. S. refineries that had been using Middle East crude contracted for all the oil they could and scoured the Southwest for more. Turning farther inland, European buyers paid high transportation charges to move oil from remote fields to tanker docks.

Buyers discovered that refineries that had been "long" on crude supplies suddenly decided to hold on to what they had and maybe pick up a little more just to be safe. They also discovered that producers were reluctant to step up production higher because they would be exhausting their reserves at less than the cost of developing new ones.

Finally, Humble Oil & Refining Co., the biggest buyer for European refineries, decided that a higher price would bring out more supply. On January 3 it raised its offering prices. Other buyers soon saw that they wouldn't be able to get the crude they needed unless they met Humble's price. One by one, during the next 2 weeks, they all raised their offering prices.

The higher price had an immediate effect in increasing supplies. Stocks of crude were sold off very fast—so fast, in fact, that there was alarm at the rate of decline. The higher price made it more attractive to recondition wells to increase their output, to truck oil and build gathering lines from wells to pipelines.

Critics immediately said: "Producers picked a bad time to raise prices. They waited until oil was scarce and then took advantage of the situation to gouge consumers."

That's about like complaining that Florida hotel rates go up in winter when everybody wants them.

The explanation is that prices of oil, hotel rooms, and most everything else are determined by the demand for them. When they're scarce and many people are clamoring for them, the price is apt to go up.

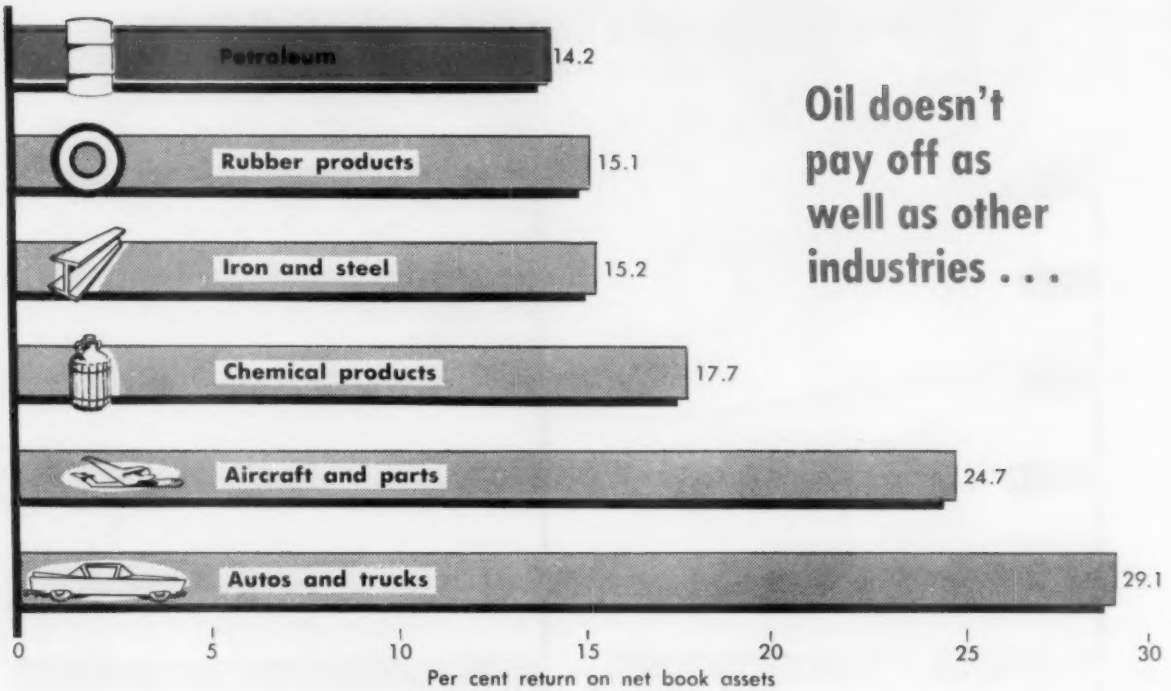
The oil industry didn't "pick" this time to raise prices. The conditions of the time just naturally brought about the increase.

Oil producers don't set their own prices, like the producers of steel, automobiles, and most articles of commerce do. Producers have no more say about the price of their oil than a farmer has about the price flour mills pay for his wheat.

Oil prices are set by the buyers of crude oil—refiners. And refiners won't pay any more for crude than they think is necessary to get what they need and keep from losing their sources of supply.

For a couple of years before Suez, producers had complained that they needed more income. Refiners agreed, but they didn't pay more because they could get all the crude they wanted at current prices. Stocks were high, domestic production was high, imports were high.

With the Suez closed, the situation was reversed. Imports were uncertain, exports shot up, stocks went way down, and buyers couldn't obtain enough crude even with production at record high levels. The laws of supply and demand operated in their usual fashion to raise the price. That's all there was to it.



Oil doesn't pay off as well as other industries . . .

Source: First National City Bank of New York.

Oil Profits Lag Behind Investment

OIL companies have the reputation of being high-profit outfits. Every independent oil operator is thought a millionaire.

Critics of the industry point these out at every turn. They conclude the oil industry to be so successful must be "gouging" the public or enjoying unfair advantages.

They're wrong on all counts.

Oil companies do make profits, but they aren't out of line with the profits made by comparable concerns. Some lucky independent operators have amassed sizable fortunes. But for every millionaire, there are hundreds of independents who have gone broke or will be broke on their next dry hole. Hundreds of others wind up with only modest estates to show for a lifetime of hard work.

Truth about profits . . . The only fair way to discuss profits is to compare them with the investment required to produce the income.

Financial studies show the rate of return on investments in domestic oil operations has been going down during the past 10 years.

An example is this survey of eight leading domestic oil companies. They were selected because they have no sizable income from profitable foreign operations. The table at right shows the net income of these companies rose 75.3 per cent from 1947 to 1956. But the net assets more than doubled to 134.8 per cent.

The rate of return on investment, as a result, has declined to a level below the average for manufacturing corporations generally. Actually the rate of return should be higher because of greater risks in oil-producing operations.

Recent declines sharp . . . The return on net assets for 92 companies in petroleum production and refining dropped from 27.9 per cent in 1948 to 14.2 per cent at the end of 1955. The average return on manufacturing concerns was 15 per cent in 1955.

Several other industries show more handsome returns than oil. Rubber products had a 15.1 per cent return in 1956; chemical products 17.7 per cent; drugs and medicines 18.3 per cent; iron and steel 15.2 per cent; autos and trucks 29.1 per cent; and aircraft and parts 24.7 per cent.

Oil's rate of return in 1955 was at its lowest point in 5 years, showing a 2.4 per cent decline in the 1951-55 period. The 1955 rate of return for manufacturing generally was 0.6 per cent higher.

Appearances deceiving . . . There's another explanation why oil men believe their profits are too low.

Profits being made now come from oil reserves discovered several years ago when finding costs were much lower. If these profits were applied to the high current investments required to find oil reserves, the rate would be much lower.

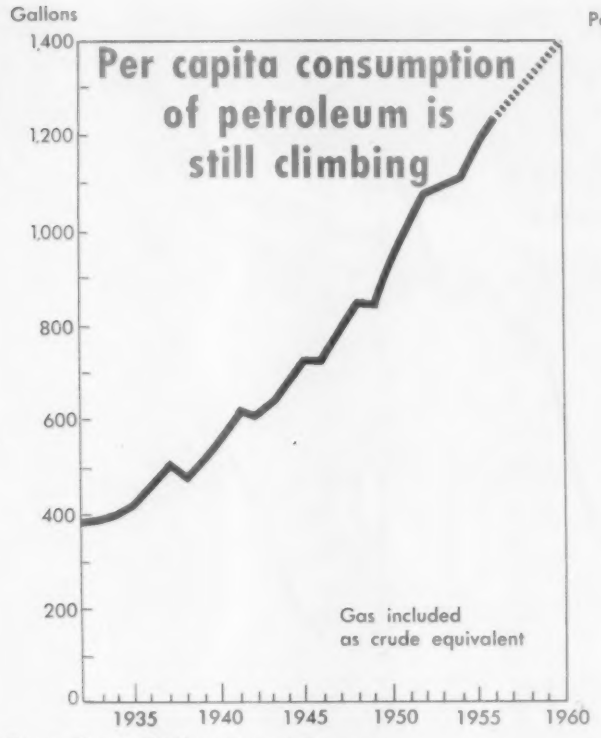
That's why oil management is worried. It fears the return on current investments will not attract capital because of the risks involved in exploration and development.

Assets Take Dizzy Rise

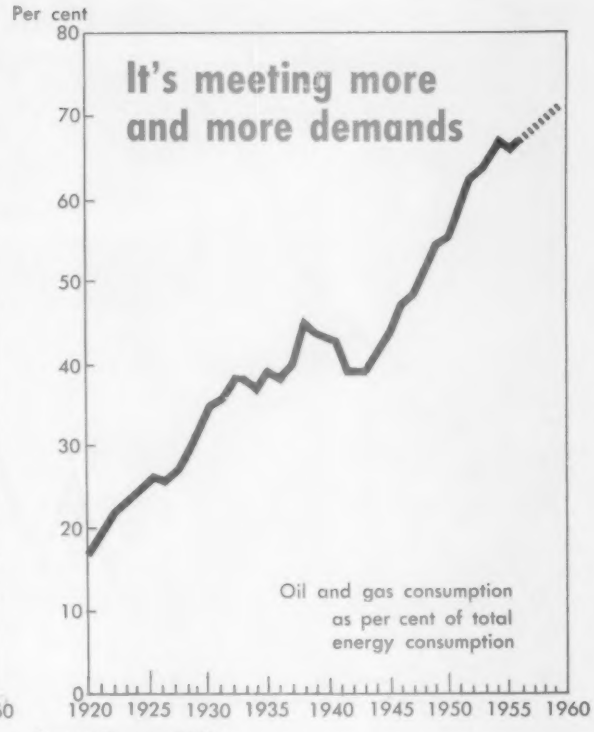
(Million of Dollars)

Company	1947 Net income	1947 Net assets	1956 Net income	1956 Net assets
Humble	124.1	559.4	178.9	1,257.5
Standard (Ind.)	94.9	924.9	167.8	1,822.6
Phillips	40.9	332.7	95.2	941.4
Continental	31.4	168.6	51.8	351.2
Ohio	29.2	139.6	41.2	335.5
Skelly	21.1	92.6	33.0	297.7
Shell	61.4	306.9	135.8	.890.1
Amerada	14.9	42.6	28.7	131.2
Total	417.9	2,567.3	732.4	6,027.2
Gain	.....	.....	*75.3	*134.8

*Per cent.



Source: Bureau of Mines, Dept. of Commerce.



Source: Bureau of Mines.

In spite of low prices . . .

Here's What the Oil Industry Is Doing

THE oil industry needed a price increase, but it didn't sit idle waiting for it. It has been going right ahead preparing to keep the country supplied with fuels for years into the future.

That's a stupendous job. It's size is indicated by the chart on this page. Our population keeps growing. Consumption of energy per capita keeps growing. And petroleum is called on to supply a constantly bigger share of the total energy needs.

The combination adds up to perfectly astounding forecasts of the volume of oil that will be needed only a few years hence.

Oil producers will have to hump to meet this demand. And they are humping. So far they have kept well ahead of the parade. Oil reserves are ready to be used when the nation needs them.

It costs money to do this, and it will cost more in the future. And the only way the industry can attract capital is by selling its oil at a price high enough to pay its debts and earn a profit. It customarily plows back the bulk of its income into developing new supplies of oil, and more and better facilities for refining and transporting it.

When there's a cost-price squeeze—as in the last few years—oil companies are hard pressed to get the funds for investments that may not begin paying off for several years. Every new oil field, pipeline, or refinery costs more to develop than those now in use. This means that oil probably will have to bring a higher price in the future if the industry is going to get the money to keep on expanding to keep ahead of its growing demand for oil.

But without waiting for higher prices, the industry has been spending millions on the gamble that it will get its money back in future sales of oil.

Most important is the addition of new crude-oil reserves to replace and augment those now slowly but surely being depleted. The charts on the next page show how much the industry has increased its well drilling, how fast production has gone up to keep pace with consumption, and how well the industry has succeeded in increasing its proved reserves. Proved reserves are oil in the ground—discovered and measured—waiting to be produced when needed in the future.

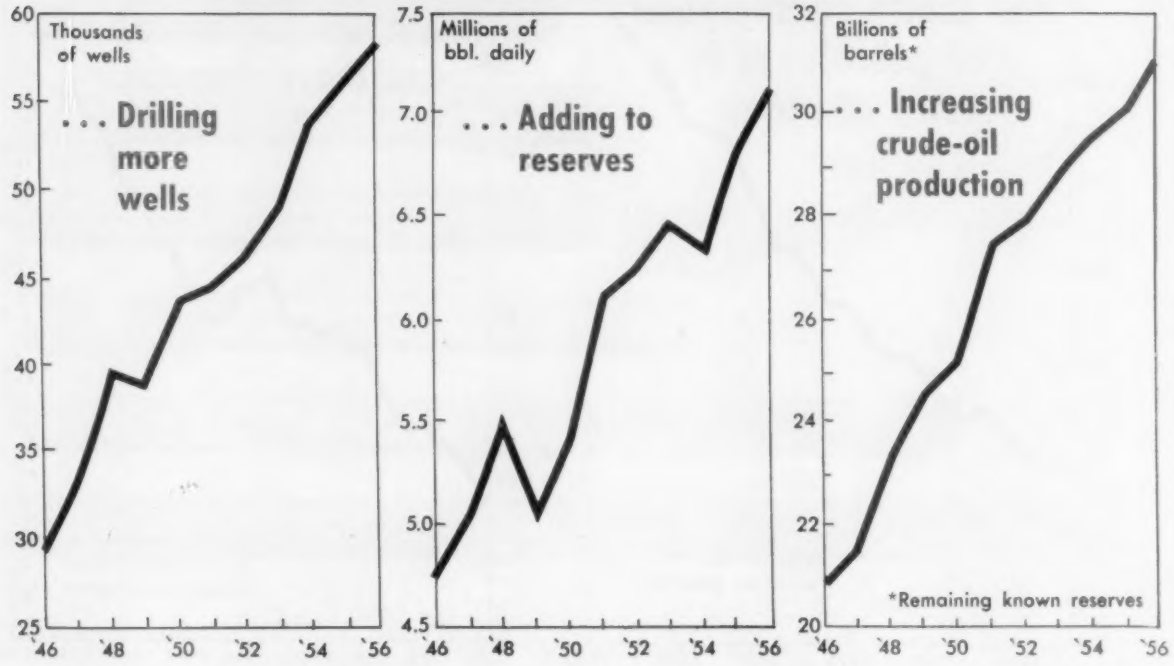
The surplus-capacity problem . . . As a result of its forehandedness, the industry today is in position to produce a great deal more crude oil than the nation needs in peacetime (so long as imports continue at their present volume).

Today the industry could increase its production in the United States by somewhere between 1,000,000 and 2,000,000 bbl. per day above the present rate of production (currently around 7,500,000 bbl. per day). The estimates vary, because nobody can tell for sure how much a new well or a new field will produce until it has been tried out at full capacity.

From a strictly business standpoint it's not economic to invest large sums in excess producing capacity that may not be needed for several years. Oil producers—being just as cost-conscious as other businessmen—are well aware of this. But they have been doing this ever since the war for two reasons:

1. Consumption of oil is increasing so fast, and the discovery and development of new oil fields is so uncer-

Despite Higher Costs, The Oil Industry Is . . .



tain and takes so much time, that producers want to work far enough ahead to make sure that they will be able to meet the country's requirements.

2. The U. S. Government asked the oil industry to develop and hold a reserve producing capacity—excess and standby—of at least 1,000,000 bbl. per day as a national-defense measure.

The Government didn't pay the industry anything for this standby producing capacity. It gave no subsidies to producers. The oil companies don't complain about this. But they do ask a little gratitude and appreciation. They want the public to understand that the cost of all the idle investment in this national-defense reserve capacity is an item in the price of oil.

This reserve producing capacity has proved its worth.

In 1951, when the United States was engaged in a military operation in Korea, Premier Mossadegh of Iran nationalized the British-operated oil industry in that country. This resulted in a shutdown of oil production and shipments in Iran, costing the Free World about 500,000 bbl. of oil per day.

The American oil industry opened up some of its standby producing capacity and filled the breach.

Again last fall when the Suez Canal was closed, this reserve capacity was drawn on quickly and heavily. Within 4 months, domestic production of crude oil was increased by 550,000 bbl. per day. Some people in the United States and Europe, who didn't understand the problem, criticized the industry for not jumping output more and quicker. But when the facts became known it was shown that crude output had increased as much and as fast as pipelines and tankers could take it from the fields to refineries and tanker ports.

Research is costly, too . . . And just in case oil ever does begin to run short in this country, the industry is spending millions of dollars a year in research to take care of such a situation.

One promising possibility is shale oil. There are millions of tons of oil-bearing shales in the Rocky Mountains, but getting the oil out at anything like a reasonable cost presents many problems. Several companies are working on these problems, making laboratory studies and running pilot-plant tests. The industry is confident that the money going into these projects is well spent, and that when shale oil is needed to supplement natural crude oil it will be available.

Much more money, of course — totaling tremendous sums—is spent by the oil industry every year in research on problems directly affecting the industry at present. This involves such problems as finding oil in the ground, drilling wells faster, producing oil more efficiently, increasing the recovery of oil from the reservoir rocks, and refining it into better products.

In short, the American people need have little worry about the quantity and quality of petroleum products for the future so long as the oil industry has the freedom and the funds to carry on the job as it has in the past. The industry considers it to be its responsibility to fill all demands of its customers, the American public.

It has been doing this right along and it is continuing to make heavy investments for the future, even during these last few years with its costs skyrocketing and its prices below par.

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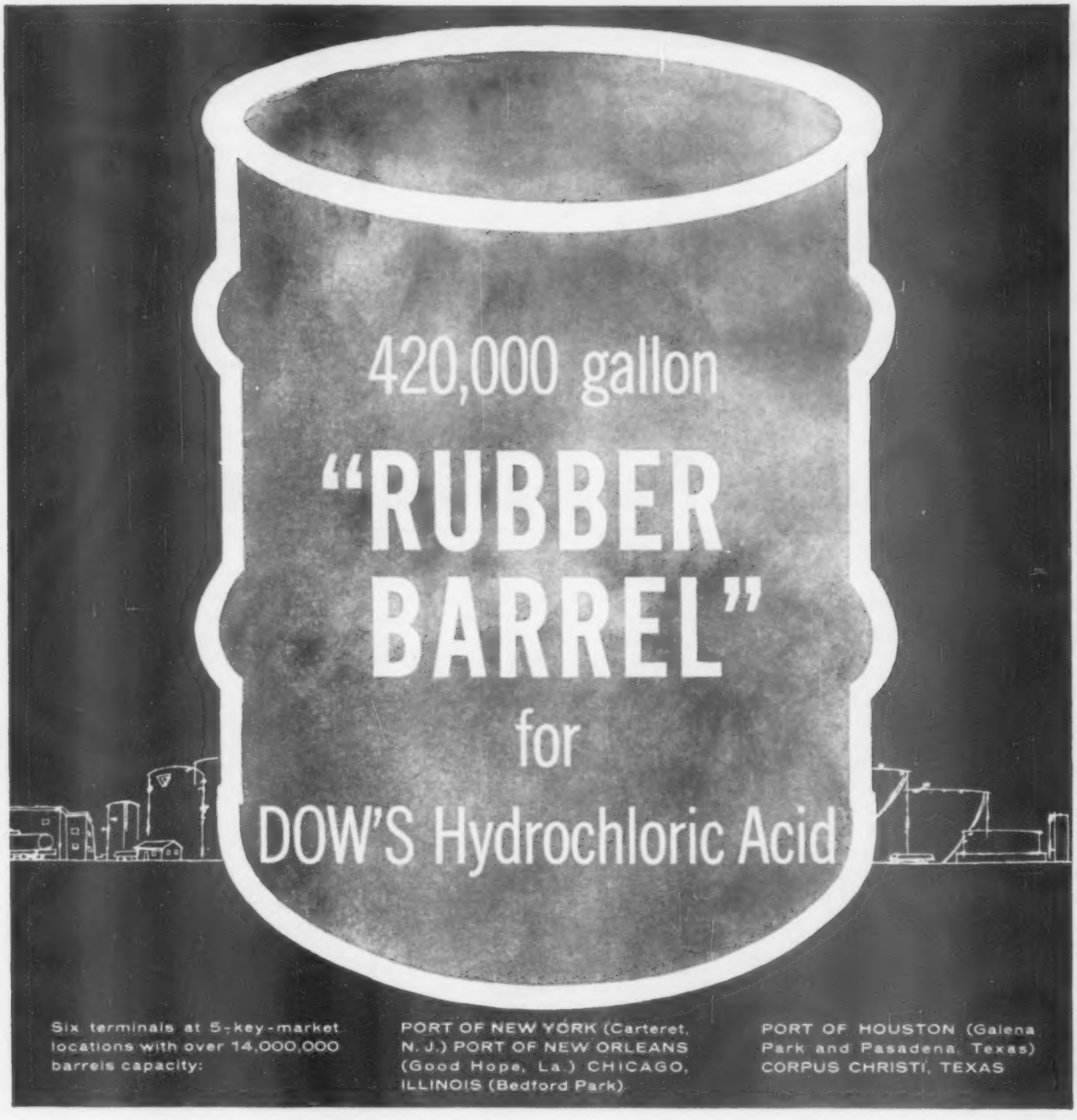
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This is No. 1 of a brand-new Journal series for refinery operators and maintenance men. It's a "grass roots" type of series. Journal editors set out to determine exactly what type of information our refining readers wanted. We visited plants in all parts of the country and talked to a number of people. The first analysis of these talks showed a number of widely prevalent troublesome problems, and some ingenious ways of solving them. We pooled all this information and came up with a six-article series on alkylation problems. These articles will appear at approximately 3-week intervals. When they've all been published, we'll tackle another subject.

Operating the Fractionation System

Problem: Control of isobutane from deisobutanizer

Solution: Improved instrumentation.

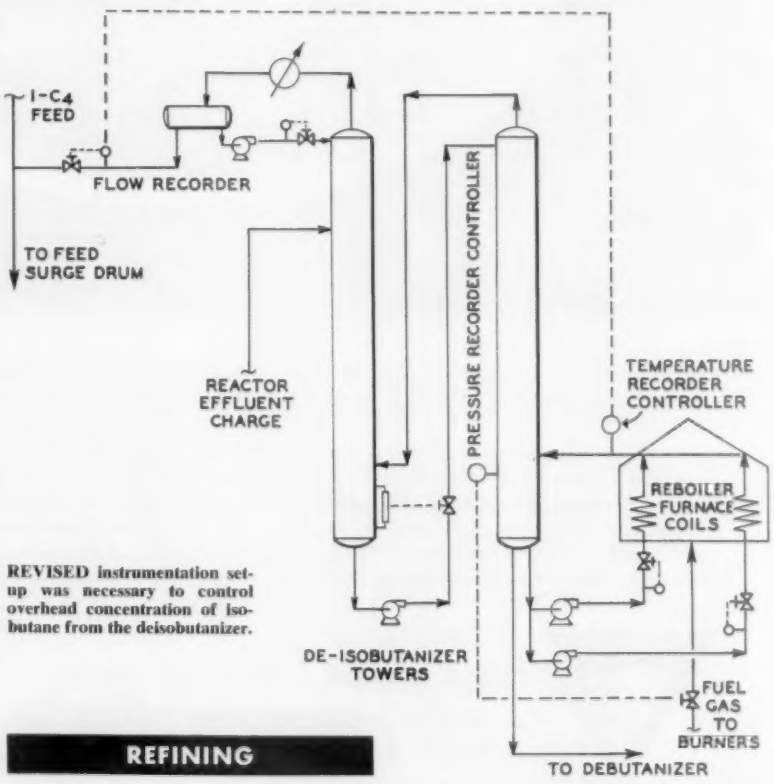
Discussion: In this particular unit, a gas-fired furnace is used to heat bottoms from the second tower in the deisobutanizer train. The two-tower deisobutanizer train functions as a single tower, with the bottoms from the first entering the top of the second tower. The overhead from the top of the first tower is condensed and then joins with incoming isobutane feed to be charged to the contactor.

In the original scheme, the differential pressure across the heater was tried and found to be unsuccessful in controlling the fuel gas rate. In the interest of another operation, it was desirable to improve the instrumentation. Initially, a change was made to control the quality of the isobutane overhead by manual operation of a rate-of-flow controller. This was located just upstream of the junction between the isobutane overhead stream and the incoming isobutane feed.

Adjustments were made according to results of boilaway tests on the tower product. The net product is a high-purity isobutane—92 per cent—with a small quantity of normal butane and propane. All heavier components are withdrawn from the bottom and charged to the debutanizer.

The process was response-timed and the diaphragm-operated spring-opposed firing control valve used was not sensitive enough for the installation. A change was made to a pressure-balanced type of firing valve which has a very fast speed of response. The instrument used requires a very narrow proportional band and fast automatic resetting. Meanwhile, instead of using the pressure differential across the heater for control, tower pressure is now used. The instrument was installed on a pressure tap in the bottom section of the second tower. The pressure therein effectively controls the fuel gas supply to the burner.

A temperature recorder controller was installed on the reboiler outlet line and this is used to control the volume of overhead product. The signal from the TRC is used to activate the now-modified RFC installation on the overhead line. The same control is used there, but instead of manual adjustment as before, the valve is controlled by the TRC. In effect, the pressure con-



REVISED instrumentation set-up was necessary to control overhead concentration of isobutane from the deisobutanizer.

REFINING

troller and temperature controller function together to maintain constant temperature on the tower by varying overhead product flow. In practice, this varies only slightly to maintain a smooth, balanced operation and high-quality output.

The controllers act as follows when the unit is on stream: If withdrawal rate of isobutane is too low, the isobutane will tend to back up in the towers, thereby increasing tower pressure. This increase of pressure will be picked up by the pressure controller in the base of the second tower. This controller will function to pinch the fuel-gas supply to the burners and cause the outlet temperature to drop. Since the control system is based on maintaining constant tower temperature, a drop in reboiler outlet temperature will cause the flow-rate valve on the overhead line to open slightly.

The flow rate will then pick up and additional isobutane will be withdrawn. This will relieve the pressure in the tower. The drop in pressure will cause the fuel gas supply to be increased, thereby restoring the temperature in the reboiler outlet to its original level. The reverse sequence is followed if withdrawal rate is too high. All of the above takes place with practically immediate response and tower temperature in effect remains constant with withdrawal rate fluctuating slightly.

The temperature at which the tower operates is governed by the total throughput and type of feed stock. Use of isobutylene polymer in addition to the usual B-B cut will result in a varying feed-stock composition. The operator will make adjustments to have tower temperature ride somewhere between 315°-340° F., depending on the feed composition and volume. For all practical purposes with a fixed composition feed and constant charge rate, one setting on the TRC is all that's required. To prevent overfiring, a high-level alarm is installed on the bottom of the second tower.

Problem: Improved deisobutanizer operation

Solution: Split the feed.

Discussion: In one alkylation unit, the deisobutanizer consists of two separate towers, one with 30 trays and one with 55 trays. They are tied together so as to act as a single, stacked tower. The bottoms from the 30-tray tower feed into the top of the 55-tray tower, and the overhead from this larger tower feeds into the bottom of the smaller tower.

Two feed streams are available to the deisobutanizer. One consists of debutanizer overhead plus some depropanizer bottoms. This stream runs about 9,000-10,000 bbl. daily with about a 75 per cent isobutane content. The second stream is simply a straightrun refinery isobutane charge. It amounts to about 2,000-3,000 bbl. with a composition of 75 per cent normal and 25 per cent isobutane.

The operators wanted to take advantage of the varying composition of the two feed streams. They did this by charging the streams separately to the deisobutanizer. The 75 per cent isostream is charged to the fourth tray of the 30-tray tower. The 25 per cent isostream, meanwhile, is charged to the fortieth tray of the 55-tray tower. The streams enter on trays where their particular composition is most nearly matched. In this manner, it's possible to get the same separation with fewer trays than if the feed were combined before charging to the tower in a single stream.

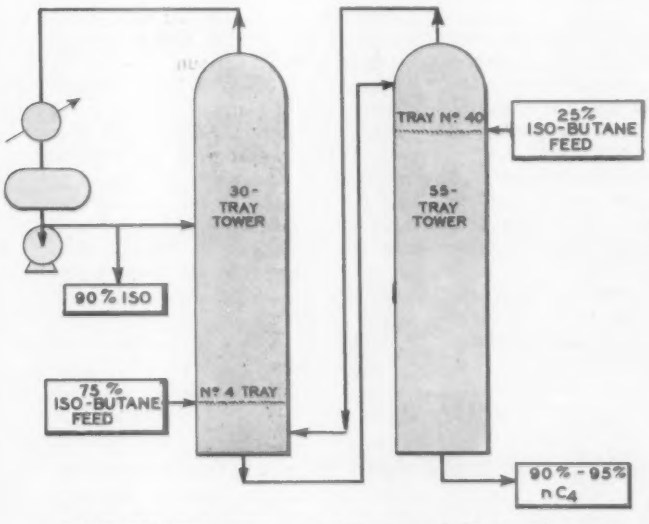
Problem: Controlling a deisobutanizer

Solution: Use combination recording-temperature and recording-pressure controller.

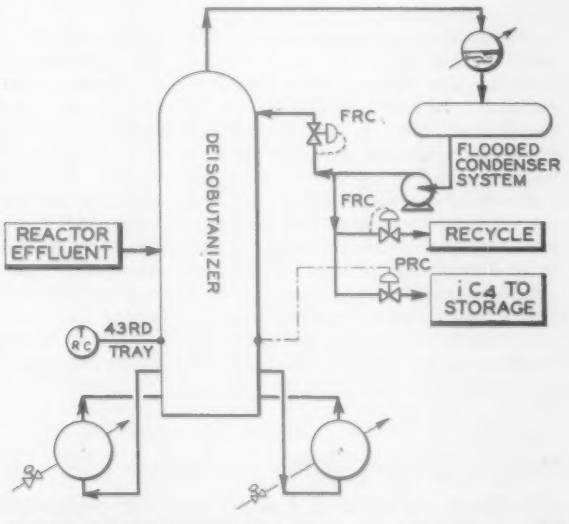
Discussion: In the routine operation of a deisobutanizer, reactor effluent is charged as feed. The isobutane is removed overhead, and the bottoms are charged to the debutanizer column. It is naturally desirable to recover as much of the isobutane as possible, both for recycle to the reactor, and for storing to be used later as makeup. An efficient method of controlling the operation of this column is to use a temperature recorder controller and a pressure recorder control.

The TRC is installed to operate off the forty-third tray of the 52-tray column. This instrument controls the steam to the reboiler, and the temperature is set so that at a constant selected pressure, the composition of the material on the tray will not include isobutane. The pressure, meanwhile, is controlled by a PRC operating off the bottom of the tower and controlling the withdrawal of isobutane to storage.

In operation, a set amount of recycle is withdrawn from the overhead accumulator and returned to the reactor. Any in excess of this is sent to



SPLITTING THE FEED resulted in improved deisobutanizer operation at one plant.



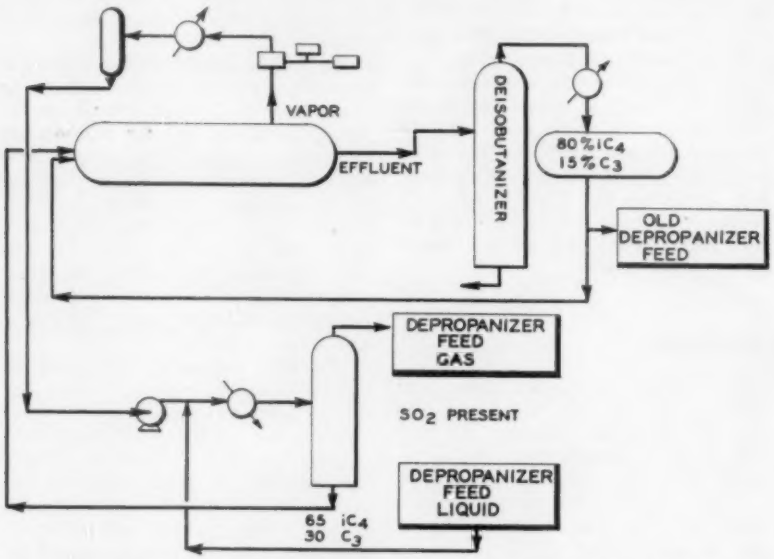
BETTER INSTRUMENTATION was the solution to a control problem on the deisobutanizer at another plant.

Blitzing Alkylation Problems

storage. If the amount of isobutane entering the column with the effluent increases, the theoretical place for the additional amount to go is down the column. However, with the conditions held as noted, it cannot go past the forty-third tray.

This excess isobutane will then go overhead and tend to flood the overhead condenser. The tower is equipped with a flooded condenser system. The flooding will thereby slow the condensation rate, and the pressure within the tower will increase. The instant this goes up, the PRC opens its control valve and the excess isobutane is withdrawn to storage until conditions stabilize. The opposite effects take place if the isobutane content of the incoming stream is low.

This setup provides a direct control of the tower operation, conserves isobutane, and eliminates the need for controlling tower pressure by the amount of isobutane entering the reactors.



A CHANGED FLOW PATTERN resulted in better depropanizing of feed stock at one plant.

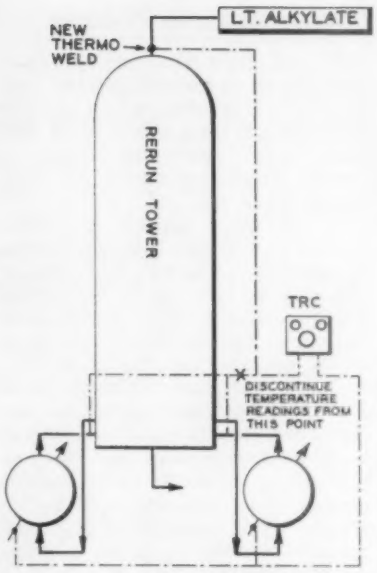
Problem: Obtaining depropanized feed stock

Solution: Pull feed off refrigeration cycle accumulator instead of deisobutanizer accumulator.

Discussion: Under original operating conditions, an alkylation unit was operated so that depropanizer feed was pulled off the overhead accumulator of the deisobutanizer tower. An analysis of this stock showed about 80 per cent isobutane and 15 per cent propane. Meanwhile, overhead vapors from the reactor were being used on a refrigeration cycle. Liquid accumulator bottoms showed an analysis of about 65 per cent isobutane and 30 per cent propane.

The higher propane content was naturally due to its coming off readily with overhead vapors from the reactor. The change was then made to obtain depropanizer feed from the richer source—the refrigeration cycle accumulator. Both the liquid and the gas from this accumulator are charged to the depropanizer. The only precaution necessary is to prevent moisture from entering the system since the propane is loaded with SO_2 at this point.

This change improved the over-all operation of the depropanizer and in effect reduced the load on the unit since a richer propane stream was being introduced. Additionally, it made it practical to charge propane-propylene to the unit since the higher propane content in the charge could be readily extracted in this manner.



A CHANGED TEMPERATURE point resulted in better operation of a rerun reboiler.

Problem: Controlling the temperature on rerun boilers

Solution: Use temperature controller on overhead line.

Discussion: In operating a rerun tower, a temperature recorder controller was used to govern steam rate into the reboilers. The TRC was tied to the discharge line of the reboilers. The temperature of the stream returning to the tower, thus governed the flow of steam to the reboilers.

This arrangement was not too satisfactory. For one thing, light alkylate overhead did not have a consistent end point.

About 95 per cent of the product off the unit is light alkylate, which is pulled overhead from the rerun tower. The remaining 5 per cent of heavy alkylate is drawn off the bottoms. Hence, it was a case of the tail wagging the dog, with rerun bottoms governing the reboiler temperatures. A change was made to have the TRC operate off the overhead vapor line. As before, the TRC controls the steam rate to the reboilers, but it is governed by the predominant flow: light-alkylate overhead. This stabilized conditions on the tower and a light-alkylate product with a consistent end point is being realized.

Next installment of this new Journal feature will appear in the April 8 issue. You'll want to clip these items and keep them for reference.

Here are some actual figures on

Cost of Pneumatic Control Systems

by E. I. Thomas

Typical over-all costs of pneumatic control systems as obtained from the experience of Carbide & Carbon Chemicals Co. instrument department are given here.

- Carbide has developed a system of unit cost figures and some of these installed costs are quoted here for items such as these: control room, panels, air supply headers, pneumatic tubing, process leads to instruments, and the instruments themselves.
- Installed costs are developed for an over-all instrument system. Three cost analyses are given according to type of system used.
- Finally, some comment is included on cost of the instrument air system and on maintenance cost.

THIS word "automation," if it hasn't already, will cause the instrument engineer a different type of headache from that normally suffered when applying instruments for automatic control. This word has gained such broad usage that now management is concerned about it and also with how much instrumentation really costs. In the past it might have been possible to install automatic control on many applications without anyone raising an eyebrow, but today the dollar sign is attached to every job.

1. Unit Cost Figures

In order for our instrument engineers to correctly estimate the many different jobs they have, we developed a system of unit cost figures for this purpose. Unit costs were developed on the basis of large instrument installations as well as smaller ones in order that we might have an average figure. By using the proper unit cost, it is possible to arrive at a close estimate for instrumentation for any given job.

Control room . . . Of course the days when instruments were installed at the equipment have long since passed, so, whenever a new unit is built, we must have a control room for (1) the convenience of the operating personnel and (2) to house the instrumentation. Most of our control rooms are built as a one-story structure 20 ft. in width with the length varying according to the amount of instruments to be applied to the process. If we reduce the cost of such a building to a linear foot basis, which is a little unorthodox, we arrive at a figure of $600 per linear foot, so, the longer the control room has to be to enclose the instrumentation the more expensive it becomes.

Panels . . . Once we have this control room, we can elect to have our panels fabricated by panel manufacturers or, by using the type of structure common with us, erect them in the field. The type of framework which we use is made of standard structural units and, as erected into panel structures, has an average height of 7 ft. The unit cost for the material to erect this framework is $5.92 per linear foot and the labor cost is $1.78 per linear foot, giving a total of $7.70. Standard-size steel panels for mounting instruments are used. These panels are 24 by 26 in. for the bottom and two center panels where the instruments are mounted and 24 by 13 in. for the top panel where pressure gages and auxiliary equipment are mounted. The cost of panels per linear foot is $23.72 and the labor for mounting these panels to the framework averages $12 per linear foot. Cutouts for mounting the large case type of instruments run $7.00 with a cost of $3.50 for the small miniature type.

The cost to mount either large or small instruments averages $10 per item.

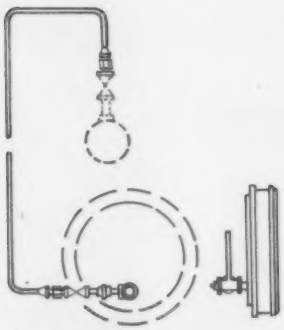
Air-supply headers behind the panel boards are usually constructed of 1½-in. standard brass pipe, which is drilled and tapped for ⅛-in. pipe connections at an equal spacing of 4 in. between tapped holes. When we use metal tubing to connect the instrument items to this air supply, the shutoff valve on the header costs $2.45 each and the material for fabricating the headers is $1.50 per foot. Labor costs an average of $1.15 to make each branch air connection and 85 cents per foot to fabricate the main header. If we use plastic tubing for the air supply to the instruments rather than metal tubing, the valve cost is reduced to $1.65 each while the labor cost remains the same. Combining all of the material and labor cost to fabricate the header, we have a figure of $14.85 per foot for metal tubing and $12.45 for plastic tubing.

At the time this analysis of instrument cost was made, ¼-in. o.d. copper tubing cost 8 cents per foot and fittings for this tubing averaged 12 cents each, giving us an average material cost of 15 cents per foot, and the labor for installing is $1.20 per foot.

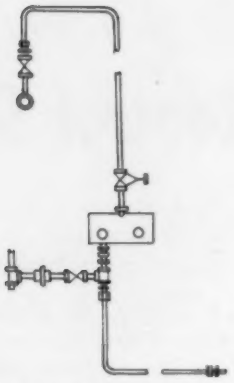
Process leads to instruments . . . For these it is necessary that the tubing used be of a material that will withstand corrosive action due to the process and, in addition, be capable of withstanding external corrosion. In many cases atmospheric corrosion is more severe than that due to the process. If copper can be used for process leads, the cost is 12 cents per foot for ⅜-in. o.d. size with an average fitting cost of 14 cents, which gives an average material cost of 20 cents per foot, and the labor to install ⅜-in. o.d. size copper tubing is $1.35 per foot. If, however, the process requirements are such that stainless-steel tubing is required, then ⅜-in. o.d. stainless-steel tubing costing 54 cents per foot and fittings averaging $2.50 give us an average material cost of $1.55 per foot. Normally stainless steel is much harder to work than any other tubing used for instrument work, so the labor cost per foot to install it is $1.75.

In the past we have had applications where neither copper nor stainless steel would stand atmospheric corrosion, so plastic-covered steel was developed. This material is fully annealed, seamless S.A.E. 1010 steel with a vinyl type extruded protective cover costing an average of 32 cents per linear foot for ⅜-in. size and cadmium-plated steel fittings average $1.00, including the protective tape which is used to seal

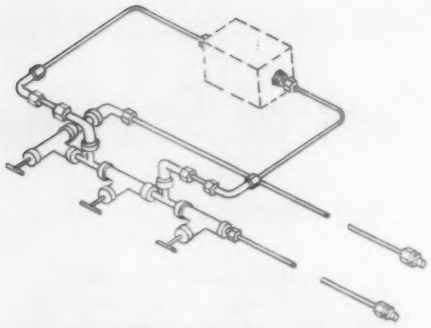
Author is chief instrument engineer for Carbide & Carbon Chemicals Co. at South Charleston, W. Va. Paper presented at I.S.A. Philadelphia meeting.



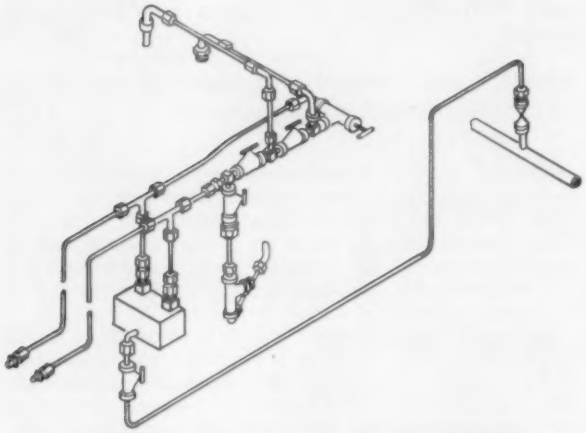
1. Static pressure. Unit cost figures for direct-connected pressure instrument: material $14, labor $36.



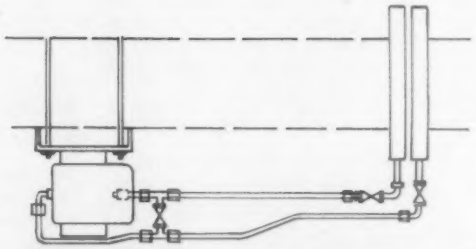
2. Static pressure with blowback. An inert-gas purge has been added: material $72, labor $60.



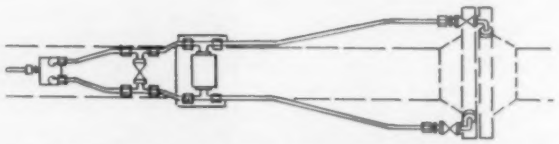
3. Dry-type instrument mounted above connections: material $103, labor $96.80.



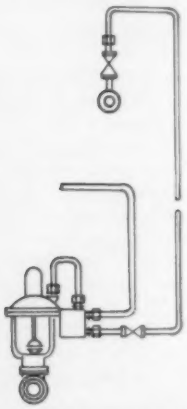
4. Mercury manometer, static blowback. When adding purge to installation of Fig. 3, cost goes up to: material $145, labor $160.



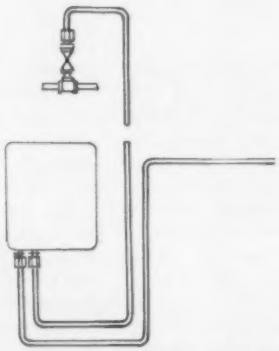
5. Differential-pressure cell, close coupled. For locally mounted transmitters: material $103, labor $125.25.



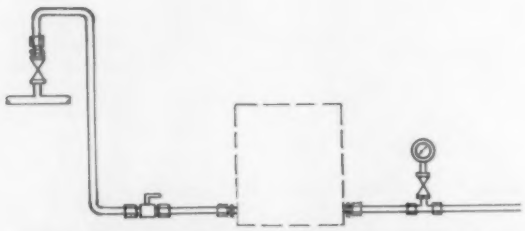
6. Differential-pressure cell with blowback. Adding purge in installation of Fig. 5 raises cost to: material $132, labor $189.60.



7. Control valve with positioner: material $20, labor $55.



8. Controller: material $30, labor $68.50.



9. Blind transmitter. If instead of indicating transmitter a blind transmitter is installed, then costs go up: material $35, labor, $77.

the fitting once it is made tight. The average material cost per linear foot is 65 cents and the labor cost for installing is $1.53 per foot. This tubing properly installed will last for many years. We have one such installation that has more than 10 years of service where previously stainless steel would not last more than 9 months to 1 year.

2. Pressure Instruments

Unit cost figures for a direct-connected pressure instrument are $14.00 for material and $36.00 for labor (Fig. 1). At this point I might state that labor is based on a figure of $6.33 per hour, which, of course, includes all overhead. Now, if we add an inert gas purge to this installation, the material cost goes up to $72.00 and the labor to $60.00 (Fig. 2). For differential pressure-type

instruments, the material costs are $103.00 and labor $96.80 (Fig. 3). Again, if we add purge to this, the material costs are $145.00 and the labor is increased to $160.00 (Fig. 4). For locally mounted transmitters such as differential pressure, the material costs are $103.00 and the labor cost is $125.25 (Fig. 5). With purge, the material cost will be $132.00 and labor jumps up to $189.60 (Fig. 6).

To connect the instrument air supply to a valve positioner averaging 20 ft. of tubing, the material cost is $20.00 and labor is $55.00 (Fig. 7). Remotely located temperature instruments will average 75 cents per linear foot to install the capillary tubing. Now, if we consider temperature transmitters instead of remotely located temperature instruments, the labor cost to mount the transmitter to the thermowell head is only $6.33. The air piping required for locally mounted controller or transmitter with an average of 20 ft. of tubing for the air supply and no connecting tubing from the transmitter or controller costs $30 for material and $68.50 for labor (Fig. 8). Now, if instead of an indicating transmitter we install what is commonly referred to as a blind transmitter, the material cost increases to $35.00 and the labor costs to $77.00 (Fig. 9). You can readily see that by having such unit costs as these, as well as costs for other standard types of instrument installations, we can then arrive at a good figure for the installed cost of an instrument system.

Installing tubing . . . I have tabulated and have shown for you on Table 1 the average material and labor cost for installing tubing of different materials. Note that our figures place the total cost for material and labor for ¼-in. o.d. copper tubing at $1.35 per foot, ⅜-in. o.d. copper tubing at $1.55, ⅜-in. o.d. stainless steel at $3.30, and ⅜-in. plastic-covered steel at $2.18, while polyethylene tubing installed in an insulated conduit averages 23 cents per foot, which price includes the material and labor to install and insulate the conduit.

3. Installed Cost—Instrument System

Now we would like to develop an installed cost for an instrument system which might involve the measurement of 70 different variables with half of the applications controlled. The instruments are broken down into 20 single-pen recorders, 10 measuring flow, 5 for temperature and 5 for liquid level; fifteen 2-pen recording controlling instruments—that is, 1 pen controlling the second pen recording—for flow and pressure; and 20 single-pen temperature controllers. This system would require 35 motor valves, 27 of which would have valve positioners. Three cost analyses are given. The first will be where the instruments are remotely located from the process by an average of 100 ft. and are direct-connected to the process. The next is for transmitters and large-case pneumatic receiver type of panel instruments and for the last we use miniature instruments with blind transmitters.

Three systems . . . The first system we will designate as A. Table 2 shows the cost of such an installation and is broken down to show the cost for instruments, the cost of connections at the instruments, the air piping from the controllers to the control valve using ¼-in. o.d. copper tubing, and the cost for the connecting leads from the control room to the process using either copper, stainless steel, or plastic-covered steel.

System B, shown on Table 3, gives the cost of the transmitter and large-case pneumatic receiver type of installation. This table, likewise, is broken down similarly to Table 2, and you will note that the process piping to the transmitters gives a smaller total figure for process tubing than was required for System A.

Next, Table 4 shows System C which covers the blind transmitter and miniature receiver instruments wherein polyethylene tubing is used for all instrument-air service from the instruments on the panel board to the remotely located junction box from which ¼-in. o.d. copper is used and which averages 20 ft. per air line. Incidentally, this system is based upon the use of six 19-tube bundles pulled into conduit thereby providing nine spare tubes for future additions to the control system, plus six pairs of wires for sound-powered telephone, one pair of which is a part of each plastic-tube bundle.

A summary of the three preceding tables is given in Table 5. Note that for Systems A and B a control room 80 ft. long costing $48,000 is required, while in the cost of System C only a 20-ft.-long structure is needed, which costs $12,000. The instruments and valves for System C cost slightly more than either A or B.

An interesting way of presenting the instrument cost figures for these systems is to take the total cost of the installation, subtract the actual instrument cost, divide by the number of major instrument items to arrive at an installation cost figure per major item. For System A, using copper tubing and 90 major instrument items, this figure is $895. For stainless-steel tubing, it is $1,011, and for plastic-covered steel tubing, it is $936.

For System B, where we have 145 major instrument items, this figure is $604 per item. Now, in the case of System C with 145 instrument items, the figure is $223 per major item.

4. Instrument Air System

The question might be raised regarding the cost of installing an in-

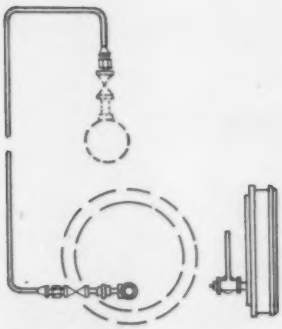
TABLE 1—INSTALLED COST PER LINEAR FOOT

	Material including fittings	Labor	Total cost
¼-in. o.d. copper	$0.15	$1.20	$1.35
⅜-in. o.d. copper	0.20	1.35	1.55
⅜-in. o.d. stainless steel	1.55	1.75	3.30
⅜-in. o.d. plastic over steel	0.65	1.53	2.18
2-in. conduit insulated	0.95	2.10	3.05
3-in. conduit insulated	1.54	3.80	5.34
4-in. conduit insulated	2.09	4.20	6.29
¼-in. o.d. polyethylene in vinyl sheath:			
19 tubes (2-in.)	0.067	0.047	*0.27
57 tubes (3-in.)	0.067	0.047	*0.21
76 tubes (4-in.)	0.067	0.047	*0.20

*Includes conduit cost reduced to linear footage of polyethylene tubing.

TABLE 2—SYSTEM A—LARGE-CASE DIRECT-CONNECTED INSTRUMENTS

	Instrument cost	Connections to instrs. at panel	Air tube ¼-in. o.d. cu.	Connecting leads—100-ft. lead: Copper	Stainless steel	Plastic over steel
5 flow recorders — process material in leads	$1,150	$999	....	$1,550	$3,300	$2,180
5 flow recorders—purge	1,150	1,525	....	1,550	3,300	2,180
5 temperature recorders — 100-ft. capillary	1,445	375	....	....	....	....
5 liquid-level recorders—purge	1,150	1,525	....	1,550	3,300	2,180
15 pressure controllers, flow recorders—purge	8,737	5,325	$2,452	4,650	9,900	6,540
20 temperature controllers — 100-ft. capillary	13,070	1,500	3,270	....	....	....
27 D.M.V.'s with positioners	8,937	....	2,025	....	....	....
8 D.M.V.'s without positioners	2,088	....	....	....	....	....
Total	37,727	11,249	7,747	9,300	19,800	13,080



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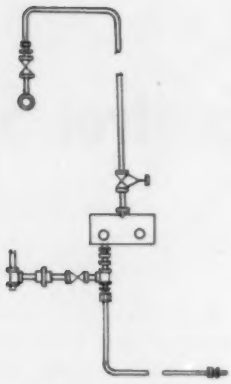

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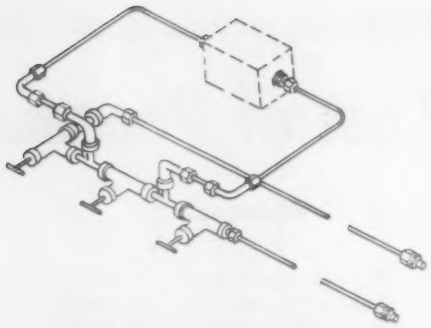

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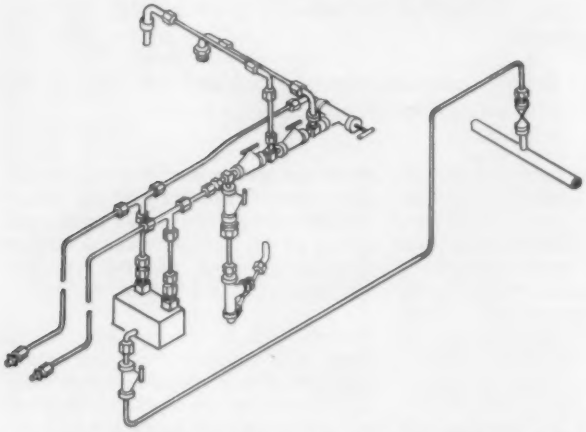
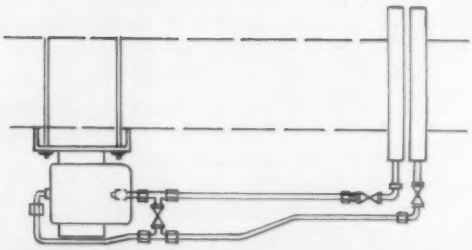
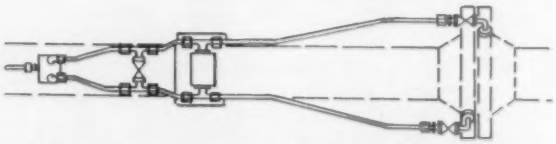


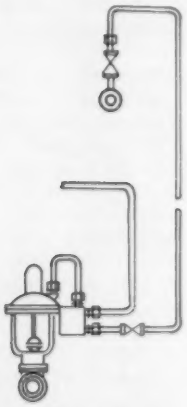
4. Mercury manometer, static blowback. When adding purge to installation of Fig. 3, cost goes up to: material $145, labor $160.



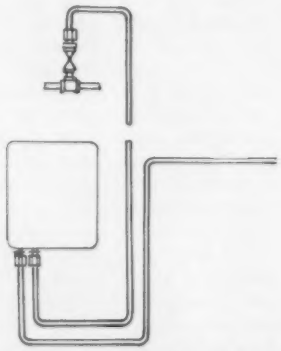
5. Differential-pressure cell, close coupled. For locally mounted transmitters: material $103, labor $125.25.



6. Differential-pressure cell with blowback. Adding purge in installation of Fig. 5 raises cost to: material $132, labor $189.60.



7. Control valve with positioner: material $20, labor $55.



8. Controller: material $30, labor $68.50.

9. Blind transmitter. If instead of indicating transmitter a blind transmitter is installed, then costs go up: material $35, labor, $77.

the fitting once it is made tight. The average material cost per linear foot is 65 cents and the labor cost for installing is $1.53 per foot. This tubing properly installed will last for many years. We have one such installation that has more than 10 years of service where previously stainless steel would not last more than 9 months to 1 year.

2. Pressure Instruments

Unit cost figures for a direct-connected pressure instrument are $14.00 for material and $36.00 for labor (Fig. 1). At this point I might state that labor is based on a figure of $6.33 per hour, which, of course, includes all overhead. Now, if we add an inert gas purge to this installation, the material cost goes up to $72.00 and the labor to $60.00 (Fig. 2). For differential pressure-type

instruments, the material costs are $103.00 and labor $96.80 (Fig. 3). Again, if we add purge to this, the material costs are $145.00 and the labor is increased to $160.00 (Fig. 4). For locally mounted transmitters such as differential pressure, the material costs are $103.00 and the labor cost is $125.25 (Fig. 5). With purge, the material cost will be $132.00 and labor jumps up to $189.60 (Fig. 6).

To connect the instrument air supply to a valve positioner averaging 20 ft. of tubing, the material cost is $20.00 and labor is $55.00 (Fig. 7). Remotely located temperature instruments will average 75 cents per linear foot to install the capillary tubing. Now, if we consider temperature transmitters instead of remotely located temperature instruments, the labor cost to mount the transmitter to the thermowell head is only $6.33. The air piping required for locally mounted controller or transmitter with an average of 20 ft. of tubing for the air supply and no connecting tubing from the transmitter or controller costs $30 for material and $68.50 for labor (Fig. 8). Now, if instead of an indicating transmitter we install what is commonly referred to as a blind transmitter, the material cost increases to $35.00 and the labor costs to $77.00 (Fig. 9). You can readily see that by having such unit costs as these, as well as costs for other standard types of instrument installations, we can then arrive at a good figure for the installed cost of an instrument system.

Installing tubing . . . I have tabulated and have shown for you on Table 1 the average material and labor cost for installing tubing of different materials. Note that our figures place the total cost for material and labor for ¼-in. o.d. copper tubing at $1.35 per foot, ⅜-in. o.d. copper tubing at $1.55, ⅜-in. o.d. stainless steel at $3.30, and ⅜-in. plastic-covered steel at $2.18, while polyethylene tubing installed in an insulated conduit averages 23 cents per foot, which price includes the material and labor to install and insulate the conduit.

3. Installed Cost—Instrument System

Now we would like to develop an installed cost for an instrument system which might involve the measurement of 70 different variables with half of the applications controlled. The instruments are broken down into 20 single-pen recorders, 10 measuring flow, 5 for temperature and 5 for liquid level; fifteen 2-pen recording controlling instruments—that is, 1 pen controlling the second pen recording—for flow and pressure; and 20 single-pen temperature controllers. This system would require 35 motor valves, 27 of which would have valve positioners. Three cost analyses are given. The first will be where the instruments are remotely located from the process by an average of 100 ft. and are direct-connected to the process. The next is for transmitters and large-case pneumatic receiver type of panel instruments and for the last we use miniature instruments with blind transmitters.

Three systems . . . The first system we will designate as A. Table 2 shows the cost of such an installation and is broken down to show the cost for instruments, the cost of connections at the instruments, the air piping from the controllers to the control valve using ¼-in. o.d. copper tubing, and the cost for the connecting leads from the control room to the process using either copper, stainless steel, or plastic-covered steel.

System B, shown on Table 3, gives the cost of the transmitter and large-case pneumatic receiver type of installation. This table, likewise, is broken down similarly to Table 2, and you will note that the process piping to the transmitters gives a smaller total figure for process tubing than was required for System A.

Next, Table 4 shows System C which covers the blind transmitter and miniature receiver instruments wherein polyethylene tubing is used for all instrument-air service from the instruments on the panel board to the remotely located junction box from which ¼-in. o.d. copper is used and which averages 20 ft. per air line. Incidentally, this system is based upon the use of six 19-tube bundles pulled into conduit thereby providing nine spare tubes for future additions to the control system, plus six pairs of wires for sound-powered telephone, one pair of which is a part of each plastic-tube bundle.

A summary of the three preceding tables is given in Table 5. Note that for Systems A and B a control room 80 ft. long costing $48,000 is required, while in the cost of System C only a 20-ft.-long structure is needed, which costs $12,000. The instruments and valves for System C cost slightly more than either A or B.

An interesting way of presenting the instrument cost figures for these systems is to take the total cost of the installation, subtract the actual instrument cost, divide by the number of major instrument items to arrive at an installation cost figure per major item. For System A, using copper tubing and 90 major instrument items, this figure is $895. For stainless-steel tubing, it is $1,011, and for plastic-covered steel tubing, it is $936.

For System B, where we have 145 major instrument items, this figure is $604 per item. Now, in the case of System C with 145 instrument items, the figure is $223 per major item.

4. Instrument Air System

The question might be raised regarding the cost of installing an in-

TABLE 1—INSTALLED COST PER LINEAR FOOT

	Material including fittings	Labor	Total cost
¼-in. o.d. copper	$0.15	$1.20	$1.35
⅜-in. o.d. copper	0.20	1.35	1.55
⅜-in. o.d. stainless steel	1.55	1.75	3.30
⅜-in. o.d. plastic over steel	0.65	1.53	2.18
2-in. conduit insulated	0.95	2.10	3.05
3-in. conduit insulated	1.54	3.80	5.34
4-in. conduit insulated	2.09	4.20	6.29
¼-in. o.d. polyethylene in vinyl sheath:			
19 tubes (2-in.)	0.067	0.047	*0.27
57 tubes (3-in.)	0.067	0.047	*0.21
76 tubes (4-in.)	0.067	0.047	*0.20

*Includes conduit cost reduced to linear footage of polyethylene tubing.

TABLE 2—SYSTEM A—LARGE-CASE DIRECT-CONNECTED INSTRUMENTS

	Instrument cost	Connections to instrs. at panel	Air tube ¼-in. o.d. cu.	Connecting leads—100-ft. lead: Copper	Stainless steel	Plastic over steel
5 flow recorders — process material in leads	$1,150	$999	....	$1,550	$3,300	$2,180
5 flow recorders—purge	1,150	1,525	....	1,550	3,300	2,180
5 temperature recorders — 100-ft. capillary	1,445	375	....	....	....	....
5 liquid-level recorders—purge	1,150	1,525	....	1,550	3,300	2,180
15 pressure controllers, flow recorders—purge	8,737	5,325	$2,452	4,650	9,900	6,540
20 temperature controllers — 100-ft. capillary	13,070	1,500	3,270	....	....	....
27 D.M.V.'s with positioners	8,937	....	2,025	....	....	....
8 D.M.V.'s without positioners	2,088	....	....	....	....	....
Total	37,727	11,249	7,747	9,300	19,800	13,080

TABLE 3—SYSTEM B—LARGE-CASE TRANSMITTER-RECEIVER INSTRUMENTS

	Instrument cost	Process tube at trans.	Air tubing cost—¼-in. o.d. copper: Trans-mitter	Field tubing	Control room	Total
20 one-pen recorders	$2,700	.....	.....	.....	.....	.....
15 two-pen recorder controllers	7,612	.....	.....	$2,025	$710	.....
20 one-pen recorder controllers	9,950	.....	.....	2,700	1,080	.....
15 diff.-pressure transmitters, direct-connected	3,600	$2,997	$1,680	2,025	710	.....
15 diff.-pressure and pressure trans-mitters—purge	5,872	4,575	1,680	4,050	1,420	.....
25 temperature transmitters	3,668	*158	2,800	3,375	1,350	.....
27 D.M.V.'s with positioners	8,937	.....	.....	2,025	.....	.....
8 D.M.V.'s without positioners	2,088	.....	.....	32	.....	.....
Total	44,427	7,730	6,160	16,232	5,270	27,662

*Mounting transmitter to wellhead.

TABLE 4—SYSTEM C—SMALL-CASE INSTRUMENTS—PLASTIC-AIR TUBING

	Instrument cost	Process tube at trans.	Air tubing cost: Plastic tubing air sup. and clk.	Plastic tubing inc. conduit†	Copper-junct. box to instr.
20 one-pen recorders	$3,600	.....	$46	.....	.....
15 two-pen recorder controller	8,250	.....	69	$345	.....
20 one-pen recorder controller	10,200	.....	92	460	.....
15 diff. - pressure transmitter, direct-connected	3,600	$2,997	.....	345	$1,680
15 diff. - pressure and pressure trans-mitter—purge	5,872	4,575	.....	690	1,680
25 temperature transmitter	3,668	*158	.....	575	2,800
27 D.M.V.'s with positioners	8.937	.....	.....	.....	2,025
8 D.M.V.'s without positioners	2,088	.....	.....	.....	.....
Total	46,215	7,730	207	2,622	8,185
Total plastic	.....	.....	.....	2,829	
Total metal	.....	.....	.....	.....	8,185

*Mounting transmitter to wellhead. †From instrument to junction box.

TABLE 5—SYSTEM COMPARISON TOTALS

	A Direct-connected	B Large-case pneumatic rec. trans.	C Small-case pneumatic rec. trans.
Control room	$48,000	$48,000	$12,000
Instruments and valves	37,727	44,427	46,215
Panel frame	432	432	108
Panels and cutouts	1,745	1,745	525
Mounting panels and instruments	1,222	1,222	718
Air header	815	815	174
Process tubing at panel	11,249	.....	.....
Process tubing at trans.	.....	7,730	7,730
Air tubing:			
Metal	7,747	27,662	8,185
Plastic	.....	.....	2,829

	Copper	Stainless steel	Plastic over steel		
Process tubing	$9,300	$19,800	$13,080	.....	.....
Total	$118,237	$128,737	$122,018	$132,033	$78,484

strument air system for a chemical plant. Since it is not likely that only one process exists within the plant, we have then based our instrument air installation figures on a delivered volume of 3,000 cu. ft. per minute, which is a volume far in excess of the requirements for any of the instrument systems analyzed. This air system is complete with compressor, aftercooler, alumina traps and the necessary piping required to deliver this utility to the units.

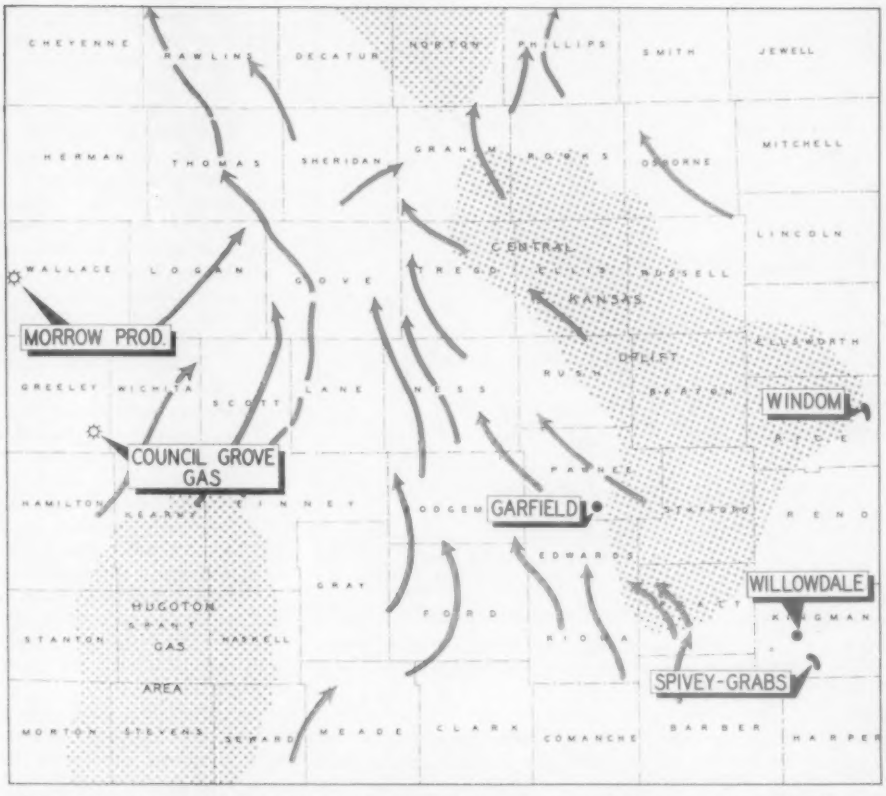
Such a system is estimated to cost $120,000. If it is amortized over a 20-year period (which most capital equipment is), we arrive at an amortization figure of 3 mills per 1,000 cu. ft. Using the current operating cost figures for air compressor stations, we find that it is 4.8 cents per thousand cubic feet of air and this added to the amortization cost gives us a total of 5.1 cents per thousand feet of clean, dry air. Now, if we take System C, which has 27 valve positioners as air using items, 55 transmitters of various types, and 35 controllers, or a total of 117 air-using items, and assume air usage at a maximum of one cubic foot per minute, we find that it costs $8.50 per day for this requirement. Actually, this cost is less than $4.00 per day since none of these items under normal conditions will use more than ½ cu. ft. per minute.

5. Maintenance Costs

Of course, no cost analysis is complete without some idea of what is required to maintain these instruments, so from accounting records we learned that our field men had 126,747 service calls last year. This, calculated on the total man-hours available, gives a cost of $5.38 for each field service call. Many of these calls are found to be due to process upsets rather than instrument troubles, and it is only because the instrument shows a condition existing different from normal that causes the operator to suspect that it is instrument trouble. We also calculated the cost of overhauling an instrument in our main instrument shop and found this to be $11.70 per major item. Incidentally, major items include control valves. This cost, of course, should be higher than for field service calls since all major items that are in need of complete overhaul as well as those that have to have parts fabricated are brought to the shop. Now, if we wish to determine the total service cost appropriated to each major instrument, including all overhead cost, we arrive at a figure of $49.60 per instrument per year. This is calculated by using the total of 157,711 man-hours available, plus instrument supervision and overhead cost, divided by the total number of major instrument items in the plant, which was 19,135. It should be stated that a number of these instruments have been installed for a period of 10 to 15 years.

Another interesting figure for comparison is derived from the number of instrument items installed or moved by our instrument fitters. Taking the number of items which they handled, divided by the total cost of installers' time plus overhead, we find that for the South Charleston plant it costs $240 per major instrument item. This, of course, covers mostly the larger case instruments since the plant is one that has been in operation for many years and does not lend itself readily to the use of miniature instruments without a complete revamping of the process being undertaken. When you consider that the cost of the building structure is not included in this figure, it compares very favorably with those given previously for new construction jobs.

To summarize then, the pneumatic instrument can be installed for $220 and can be operated each day at a cost of approximately 3.5 cents for air and serviced for 13.5 cents, thus giving a total daily operating cost of 17 cents per instrument. **End.**



OPERATORS ARE FANNING OUT in all directions from the Central Kansas uplift, looking for new oil and gas reserves. Positive structural trends at Stone Corral level are indicated by the arrows. (Base map courtesy Kansas Geological Survey, adapted from Wallace Lee and Daniel F. Merriam.) Fig. 1.

Kansas—Happy Hunting for Independents

Because . . .

- Numerous pay zones exist at shallow depths
- Acreage prices are low
- New fields continually being found
- Geophysical survey success good, and inexpensive

THERE'S still a lot of undiscovered oil in Kansas.

If you don't believe it, ask any Kansas independent. He likes the state. Drilling depths seldom exceed 5,000 ft. Acreage prices are low. Numerous pay zones exist at shallow depths. Detailed subsurface studies are continually finding new oil fields. Geophysical surveys enjoy a satisfactory success ratio and in addition are inexpensive. Kansas is still a good spot for the small independent.

Kansas oil finders follow two lines in looking for new oil: one is a combined geologic and seismic approach, and the other is largely geological, emphasizing stratigraphy rather than structure.

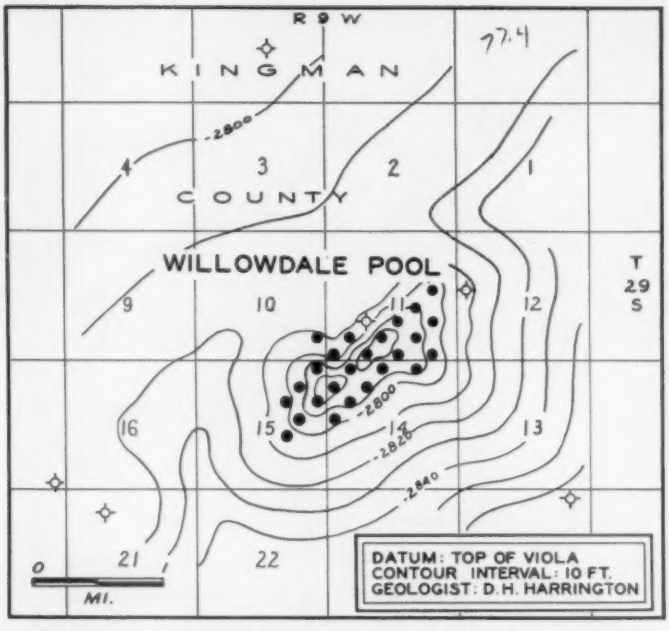
Geophysical . . . Seismic for the small operator in Kansas is a good investment. Contract companies are available that specialize in "hot shot" jobs. i.e., short-term contracts where the shooting will involve only a few shot holes or at most 3 to 5 days' work. These contracts are let on a job, a day, or a shot-hole basis. Contractors will average 8-10 shot holes per day and the cost per shot hole runs about $75-$100, depending upon amount of work done, type of contract, terrain, and shooting conditions.

Seismic results are reliable. For example, one major company improved its development drilling record substantially when it began using geophysics for spotting edge wells and stepouts. Small operators claim that one out of four geophysical prospects drilled produces. And geophysics is used to spot field wells as well as wildcats.

Best success with geophysics has been on the Central Kansas uplift. As this province is largely drilled up, operators are stepping out into the deeper parts of the basin.

On the Central Kansas uplift (Fig. 1),

by Norman S. Morrisey
Drilling-Development Editor



WILLOWDALE is a typical microstructure, discovered by seismic work. Notice that the producing closure is only 30 ft. (From Kansas Oil and Gas Pools, Vol 1, published by the Kansas Geological Society.) Fig. 2.

there is usually enough subsurface control to pin point an area of interest. A seismic program is outlined, and a few days' shooting will either confirm or eliminate the lead. Many prospects are checked with less than a full day of shooting. The problem is to determine if the closure actually exists on a subsurface lead or if it is possible to get higher on a small structure than a dry hole with shows of oil.

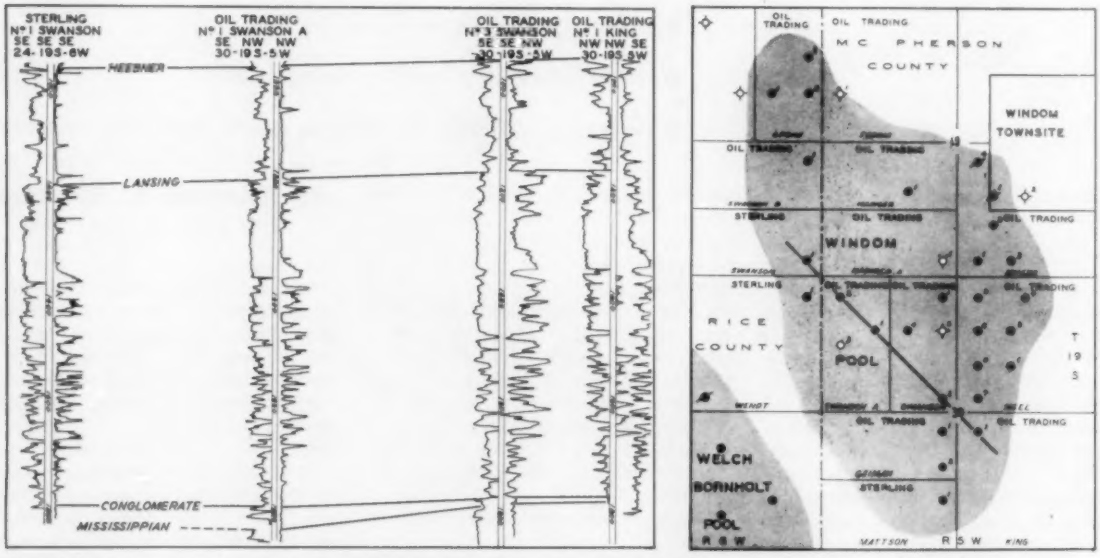
Isotime mapping technique . . . This type of seismic mapping has been developed into a useful and reliable technique in Central Kansas. In most parts of the area, shooting gives good-quality records, and it is possible to carry reliable correlations considerable distances.

Invariably, however, the structures are low relief and cover a limited area (see Fig. 2, Willowdale field). The seismologist may be working within the limits of error of the reflection technique, particularly if there is any great variation in the near-surface velocities. For this reason, geophysicists have adopted the use of isotime maps to show structure. These are simply isopach maps between two easily identified geologic markers and correspond to the more familiar isopach maps. The primary purpose of the isotime maps is to show structure accurately and to eliminate near-surface problems that render the seismic results unreliable. The results have proved to be most satisfactory and structures with only 20-50 ft. of relief are mapped with considerable accuracy.

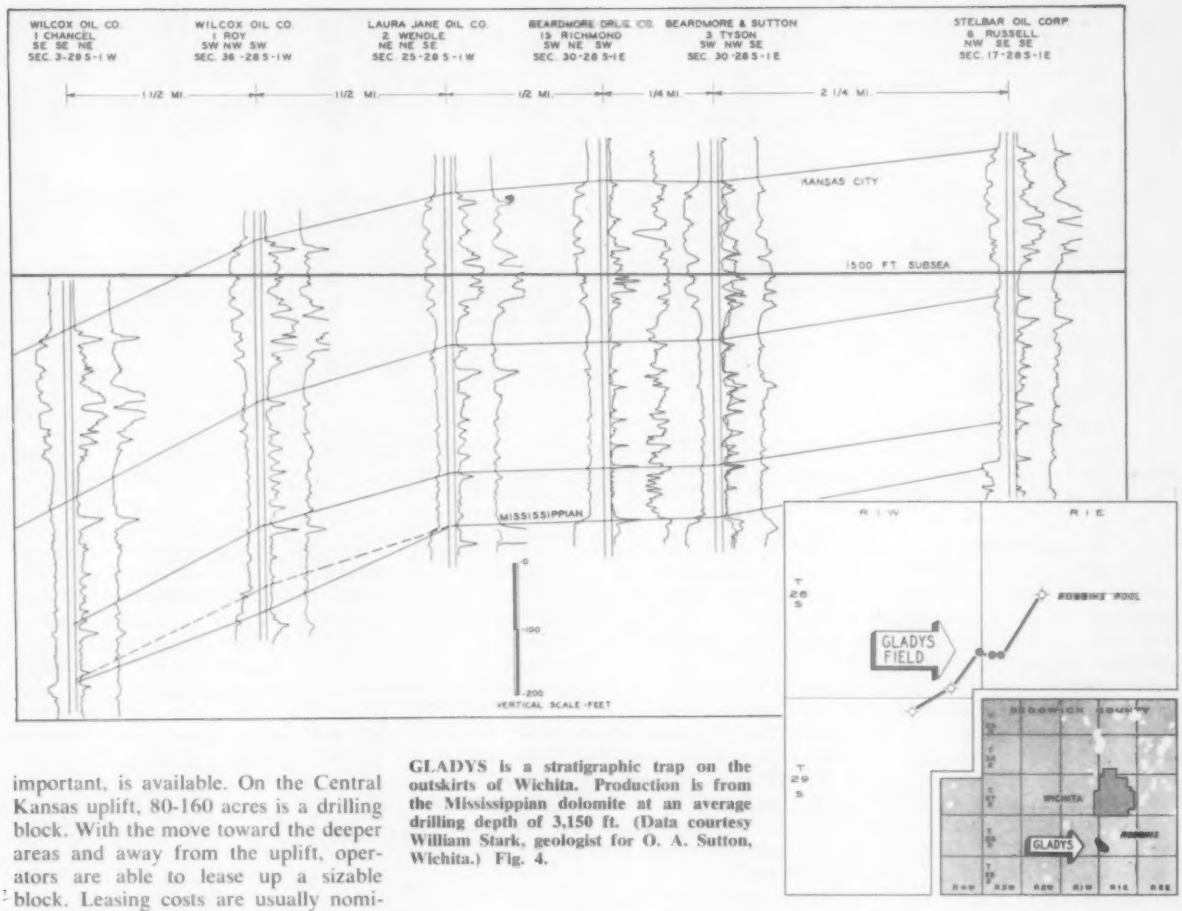
Changes in intervals below the Stone Corral anhydrite are a good indication of structure and this "anhydrite method" of seismic mapping is used in many parts of Kansas. The Stone Corral anhydrite occurs over a wide area in Central and western Kansas. Invariably there is thinning over oil prospects between this marker and the underlying Lansing-Kansas City or Arbuckle. For this reason, an isotime thin in the section below the Stone Corral is valid justification for drilling a test, particularly on the Central Kansas uplift.

Operators have acquired confidence in the "anhydrite method" through the results of successful drilling of these isotime prospects.

New areas . . . Emboldened by their successes on the Central Kansas uplift, operators are beginning to fan out in all directions from this old producing area. With this action, geophysical costs are rising. Instead of 1 to 5 days' shooting, a seismic program may involve 10 days' work, or even longer. However, cost of acreage is less and, more



WINDOM is a two-zone seismic discovery with production from both the Mississippian chert and the basal Pennsylvanian conglomerate. Seismic work was very successfully used to spot development wells. (Data courtesy M. W. Smith, consultant, Wichita.) Fig. 3.



GLADYS is a stratigraphic trap on the outskirts of Wichita. Production is from the Mississippian dolomite at an average drilling depth of 3,150 ft. (Data courtesy William Stark, geologist for O. A. Sutton, Wichita.) Fig. 4.

important, is available. On the Central Kansas uplift, 80-160 acres is a drilling block. With the move toward the deeper areas and away from the uplift, operators are able to lease up a sizable block. Leasing costs are usually nominal, seldom exceeding $5 per acre.

Geological Approach

Kansas, like many other areas in the country, is stressing the stratigraphic approach. This type of exploration requires only a modest outlay of cash prior to the drilling of a well and for this reason, it fits the pistol of the typical Kansas independent.

Principally stratigraphic oil comes from the Mississippian, but the Lansing-Kansas City section and, more recently, the Cherokee and Morrow sands are assuming roles of major importance. However, it is difficult to separate and distinguish stratigraphic oil from structural because of their very close relationship. Geologists consider both structure and stratigraphy even when looking for strat traps.

Oil finders concentrate their studies along the flanks of the Central Kansas upiift, but the stratigraphic search, too, is venturing into the deeper parts of the basins. In the carbonate sections, the geologists play porosity and permeability trends with a fair degree of success. One small drilling company has scored 7 successes out of 10 wildcats in the past 12 months, an enviable record.

Pennsylvanian sands are receiving close study along the flanks of the Central Kansas uplift where there have been several recent Cherokee sand discoveries. In Kiowa and Comanche counties, gas production from the Mississippian is the main target. Farther west, the Morrow sand becomes an important gas reservoir.

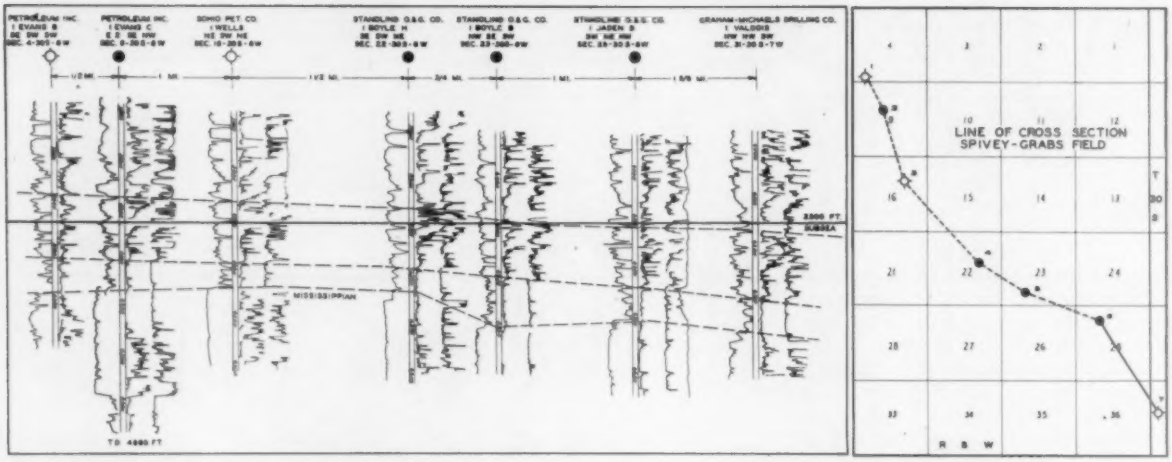
Kansas has long been an important gas-producing state, but today many companies are "gas happy." The reason is simple. Gas wells are more profitable and show a faster payout than do oil wells **if there is a market for the gas.** The profit factor in exploration determines what to look for. And at the moment in Kansas it is gas. Actually this does not seriously hamper the oil finder. Basically oil and gas reservoirs are very similar, particularly with regard to their geology. The same type of thinking that finds new oil fields will find new gas fields.

Seismic Discoveries

● Willowdale in southwestern Kingman County is a typical seismic discovery. The anticline covers 840 acres but has only 40 ft. of relief (Fig. 2). The Viola limestone, the pay zone, has a 30-ft. oil column. Production occurs at a drilling depth of 4,500 ft. The discovery well at Willowdale was drilled by Aurora Gasoline Co. and Aylward Drilling Co. on a farmout from Cities Service Oil Co. The well flowed 265 bbl. of oil per day on completion test.

● Windom pool (Fig. 3) was discovered in December 1953 by Oil Trading Associates, Inc., and Trans-Era Petroleum, Inc., at their 1 Neel, in NE SW NE 30-19s-5w, McPherson County, Kansas. Initial potential was 175 bbl. of oil, plus 25 per cent water, after fracture treatment. Producing section is Mississippian chert. Production was also proven from the basal Pennsylvanian conglomerate by good oil recovery in a drill-stem test. Gravity of both Mississippian and conglomerate oil is 32° to 34°, corrected.

Location of the Windom pool structure was by subsurface geology supplemented by seismic survey, with the location of the discovery well chosen from the seismic data. Following the pool discovery, operators adopted a policy of evaluating nearly all locations with seismograph before drilling. Use of the seismic data, in combination with subsurface data, has resulted in the drill-



SPIVEY-GRABS is a large strat trap with 198 oil wells and 45 gas wells. Development drilling is still in progress. (Data courtesy Jerry Pike, Pickerell Drilling Co., Wichita.) Fig. 5.

ing of 24 producing wells out of 27 starts by the pool discoverers.

Eighteen of the producing wells are productive from Mississippian chert, and some of these have proven conglomerate production behind casing; six are productive from the conglomerate.

● John Creek field was brought in by William Gruenerwald and associates in their 1 Williams located in NE NW 26-15s-9e, Morris County, about 10 miles southwest of Davis Ranch field. Production of 426 bbl. of oil per day from the Viola at 3,090-96 ft. was reported from the discovery well. Since the completion of this combination surface geology and seismograph find, 10 wells have been completed. Production during 1955 amounted to 52,644 bbl. of oil.

Strat Traps

● Gladys field (Fig. 4), discovered in south central Sedgwick County in October 1954, has developed into a significant stratigraphic trap with over 200 wells.

Production in the Mississippian dolomite results from porosity development against a permeability barrier separating Gladys field from old Robbins field, in some cases only ⅛ mile to the northeast. Limited seismograph was attempted on this prospect before the Beardmore-Sutton 1 Tyson was drilled, but seismograph was inconclusive at best in this area.

The original well touched off a mad scramble for open leases. This resulted in rapid development because of the small size of the tracts available and the short-term drilling commitments that were required to lease tracts. The dolomite is well developed within the Gladys field and thins abruptly along the permeability barrier to the northeast. While the field is clearly a stratigraphic trap, it is located on a regional structural high trend which includes Greenwich-Eastborough, Robbins, and Gladys fields within a distance of 18 miles. However, without the permeability barrier mentioned above, the dolomite in Gladys field would all have been too low to produce comparing its subsea datum to nearby Robbins field. The pay zone averages 35 ft. thick, 18 per cent porosity, 50 md. permeability at an average depth of 3,150 ft. Most of the wells originally flowed 44°-gravity oil and many of the wells in Gladys field are still flowing at this time.

● Spivey-Grabs field (Fig. 5) is located in Kingman and Harper counties, Kansas. Production was first obtained from the Grabs portion in November 1949 with the completion of Drillers Production Co. 1 Grabs. Production in the Spivey area was started with the completion of Stanolind 1 Boyle in October 1951. Since then, development has been continuous. At the present time there are approximately 198 oil wells and 45 gas wells. Cumulative oil production from the area to July 1, 1956, totals 2,380,000 bbl. Cumulative gas production from the area as of July 1, 1956, totals 3,000,000 M.c.f.

The producing horizon in the Spivey-Grabs field is the Mississippian formation. In this area, total thickness of the Mississippian is approximately 300 to 350 ft. It is thinning to the north by reason of erosion as it flanks the Central Kansas uplift. The beds of the Mississippian are dipping to the southwest approximately 30 ft. per mile. The erosion accompanying the truncation of the Mississippian probably altered the original sediments which were very dense. The weathering effect caused secondary porosity and permeability to be developed in varying degrees throughout the area.

Both oil and gas apparently exist separately in this reservoir making a combination type of oil and gas pool. Widespread differences in gas-oil ratios, etc., promoted the need for some kind of regulations to conserve reservoir energy. A detailed engineering study was made and the resulting field rules based upon volumetric withdrawal were approved by the Kansas Corporation Commission and became effective July 1, 1956. This action marked a big step forward for Kansas in its conservation program.

Construction is now almost complete on a gasoline plant and both high-pressure and casing-head gathering systems for the field. This plant is jointly owned by most of the operators in the area with Magnolia Petroleum Co. as operator. The plant will process gas from gas wells and oil wells. Kansas Power & Light Co. is purchaser of the gas and it will be marketed wholly within the State of Kansas.

● Garfield was revived in 1953 with the completion of the Hilton Drilling Co., Inc. 2 Hutchinson estate in SE NW 17-23s-17w. An initial potential of 25 bbl. of oil per day from the "Misener sand" at a depth of 4,276 to 4,298 ft. was assigned the discovery well. Study of a special nomenclature committee resulted in the assignment of the Pennsylvanian-Mississippian contact zone as the pay zone. During 1955 production from 166 wells amounted to 916,006 bbl. of oil. Cumulative production comes to 1,085,401 bbl.

Acknowledgment

Many people assisted with the preparation of this article, but special thanks are due M. W. Smith, consultant, Wichita, for the data on Windom pool; Jerry Pike, Pickerell Drilling Co., Wichita, for the geological data on Spivey-Grabs field; and William Stark, O. A. Sutton, Wichita, for the geological data on Gladys pool. **End.**

QUANTITATIVE LOG ANALYSIS—5

How to Get True Resistivity From Normal Curves

by
Dr. R. G. Hamilton
and
Paul Charrin

CHART 8 presents P.G.A.C. simplified normal departure curves. The chart includes 12 sets of graphs showing, for a hole diameter of 8 in., a particular bed thickness (10, 13.3, 16.6, 20, 26.6, or 33.3 ft.), and particular diameter of invasion (8, 16, or 40 in.), plots of R_t/R_m vs. R_a/R_m for three different two-electrode (normal) spacings (16, 38, and 64 in.). Each graph has curves for four different values of R_i/R_m (6, 11, 21, and 51) which are coded.

Assumptions

The graphs can be used to determine the true resistivity, R_t, of a single bed which:

1. Has a thickness, e, between 10 and 33.3 ft.
2. Is cut by a hole of 8-in. diameter.
3. Has an invasion diameter, D_i, between 8 in. (no invasion) and 40 in., and a resistivity of invaded zone, R_i, not greater than 51 times the mud resistivity, R_m.
4. Is surrounded above and below by a thick formation of resistivity, R_s, which is approximately equal to that of the mud, R_m.
5. Has apparent resistivities obtained using two-electrode arrangements with spacings of 16, 38, and 64 in. These three resistivities are referred to as $R_{16''}$, $R_{38''}$, and $R_{64''}$.
6. Has a mud resistivity, R_m, and bed thickness, e, fairly accurately estimated.

Procedure

The following procedure should be used first on the $D_i=2d$ chart and then on the $D_i=5d$ chart of the appropriate bed thickness.

1. Compute $R_{16''}/R_m$, $R_{38''}/R_m$ and $R_{64''}/R_m$. Using the scales under each graph and the straight edge of a piece of paper or transparent film, index the edge with a pencil at the left side of the chart and at the resistivity value for each of the three spacings.
2. Select a set of curves for the estimated bed thickness. If a chart is not available for the exact thickness desired, use, successively, the nearest two thicknesses, one above and one below the estimated one.

The authors are, respectively, head of Hamilton Well Log Consultants, Tulsa, and president of Perforating Guns Atlas Corp., Houston.

3. Line up the left index mark on the straight edge with the left of the chart.
4. Move the straight edge straight up (always keeping the index mark lined up with the left of the chart) until the three plotted points on the straight edge fall on curves of the same code or fall about the same fraction of the way between pairs of the same code. To interpolate between curves use the horizontal distance.
5. The height at which the three points can be lined up on or between curves of the same code can be read on the vertical scale at the left. This value is R_t/R_m. R_t is then obtained by multiplying this value by R_m.
6. For all but the solid curves, the code shown on the charts indicates the value of R_i/R_m for the formation. R_i may be obtained from the R_i/R_m value at which the points line up by multiplying by R_m. Should the points line up on the solid curves, this procedure, to determine R_i, should be omitted, since these are the curves for noninvaded formations.
7. If the procedure given in 5 and 6 has been followed for two thicknesses, values of R_t and R_i for a formation of intermediate thickness can be obtained by linear interpolation.

Hole Diameter

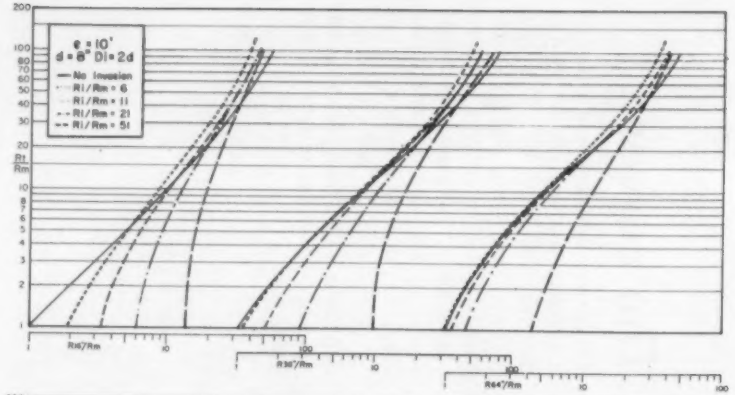
The graphs were prepared for a hole diameter of 8 in. Nevertheless, these can be used for hole diameters from 7 to 9 in. R_t can be obtained with reasonable accuracy for quantitative analysis in the areas where such normal departure curves would logically be used for thin, resistive beds.

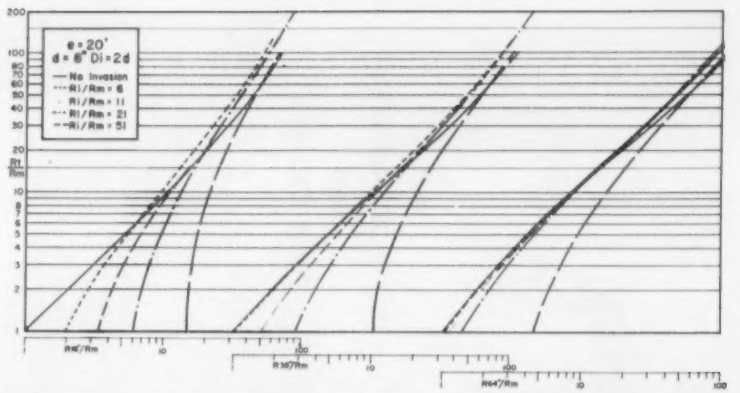
The procedure outlined above is presented in the simplest manner for the primary purpose of instruction in the basic approach to curve matching. The results should be good if the fundamental data are correct, particularly if R_m has been determined with reasonable accuracy.

A more detailed system of curve matching for the determination of R_t is required when R_m may be in error by 25 per cent or more. This more elaborate system is described in another publication available from the authors upon request.

The curves . . .

Three normal curves, each with a different spacing, can be used to find true resistivity by the graphs of the following two pages. Values from the normal curves need no correction so long as hole conditions fit the assumptions given here. The method is essentially one of simultaneously solving several equations expressing the relationship of resistivities around a bore hole.





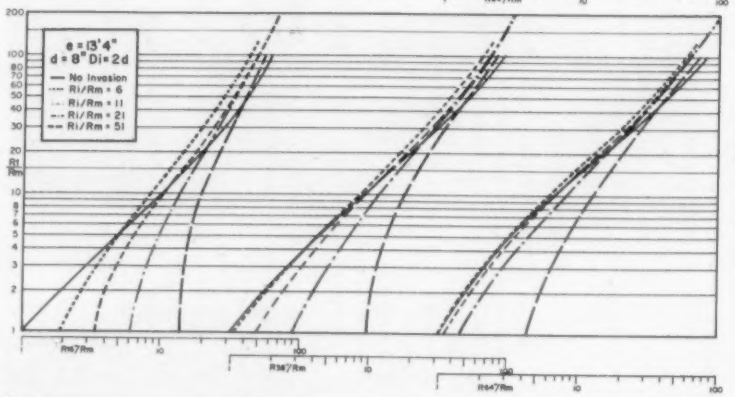
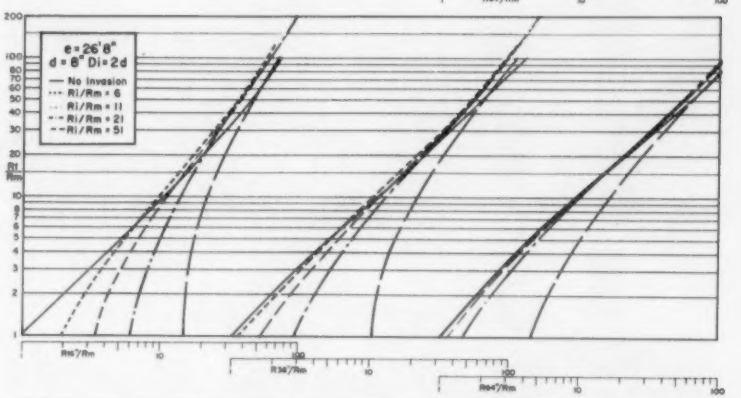
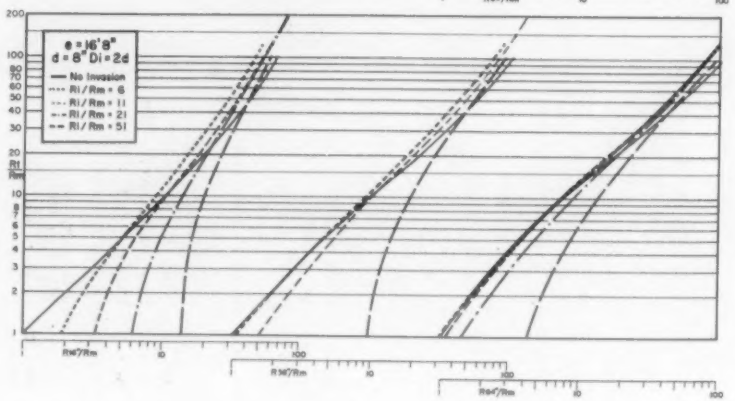
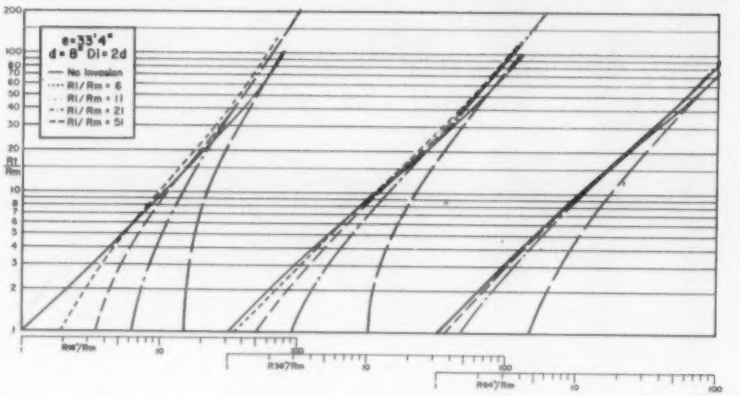
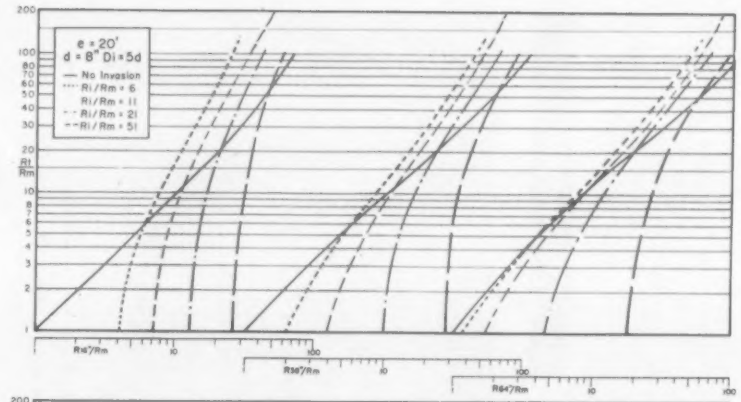


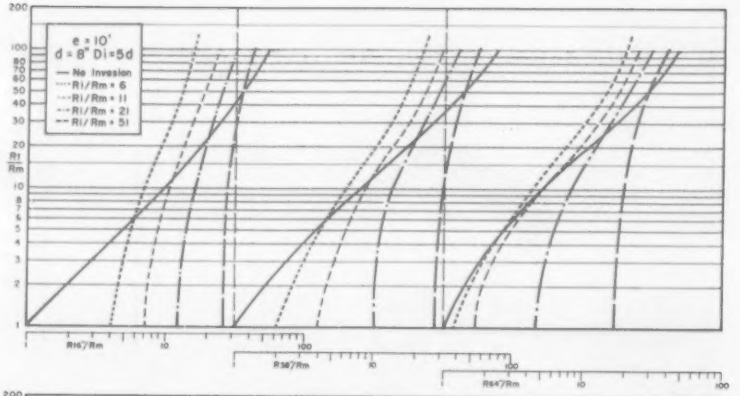
CHART 8 Simplified Normal Departure Curves











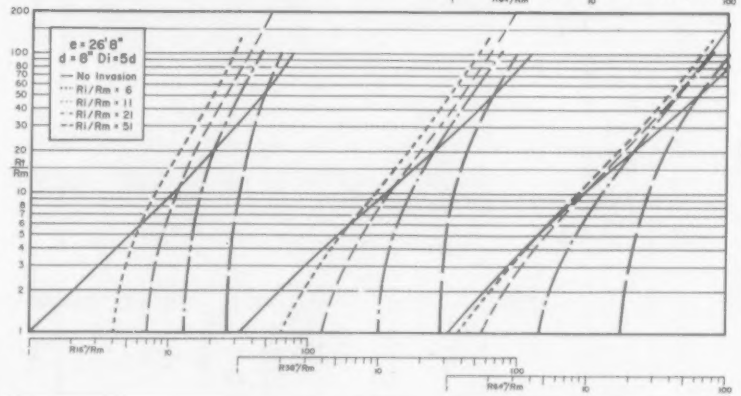
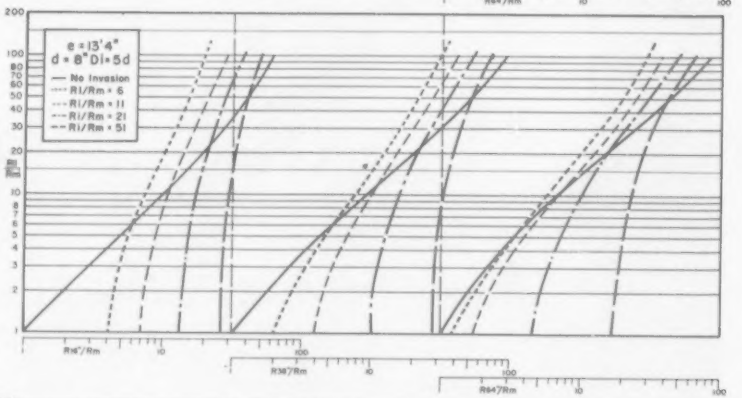
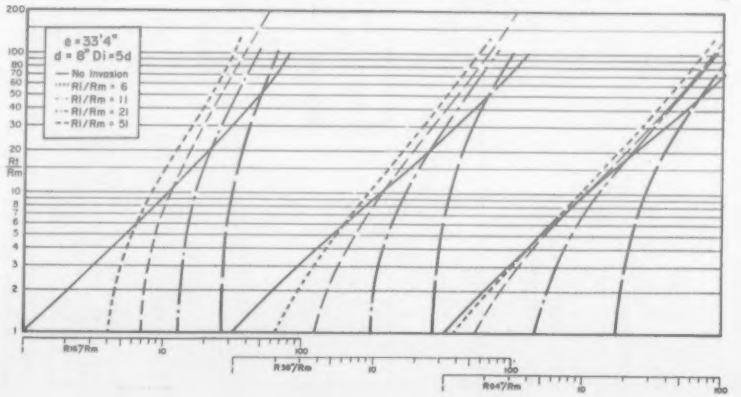
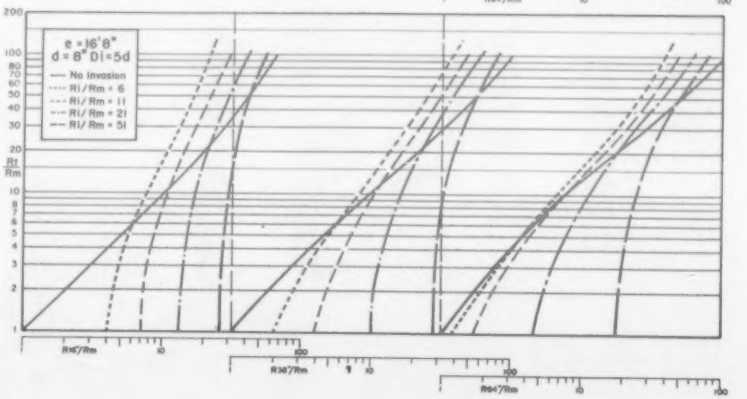


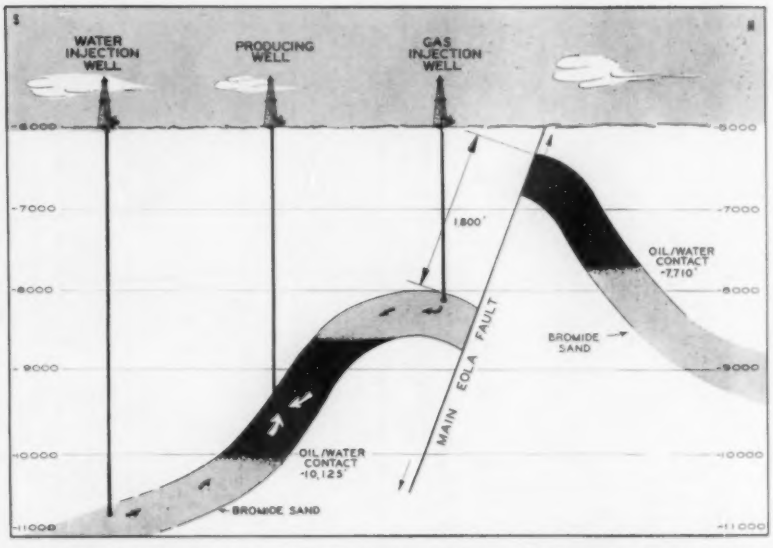
CHART 8 (continued) Simplified Normal Departure Curves







Secondary Recovery At Eola Goes Deep, Comes High



A COMBINATION GAS AND WATER injection project will increase the ultimate recovery from the south flank at Eola by 72 per cent. Simplified diagram shows relation between south flank and adjacent producing area of the north. Fig. 1.

- Well-designed public-relations campaign by operator facilitated formation of unit.
- Project will reduce producing life of field from 25 to 15 years.
- Combination water flood and gas injection will increase ultimate recovery by 72 per cent.
- Project requires 12,200-ft. water-injection wells.

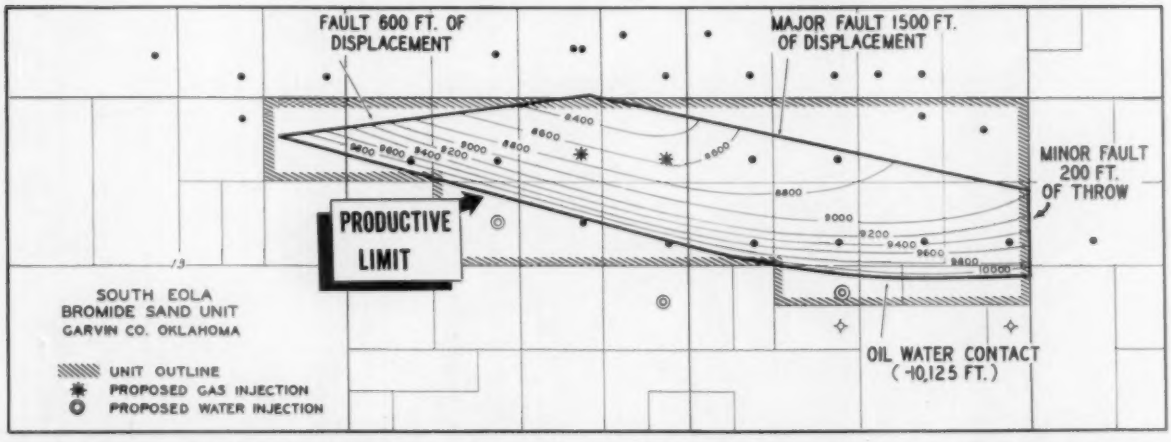
by Norman S. Morrisey
Drilling-Development Editor

A CAREFULLY designed public-relations program helped Sohio Petroleum Co. assemble a secondary-recovery unit rapidly in Eola field, Garvin County, Oklahoma. Sohio engineers made a careful study of the field and discovered that the south flank of the field would respond to a combination gas-and-water-injection project. After a complete study of the wells, Sohio approached the royalty owners, giving each a detailed engineering report on the advisability of the project.

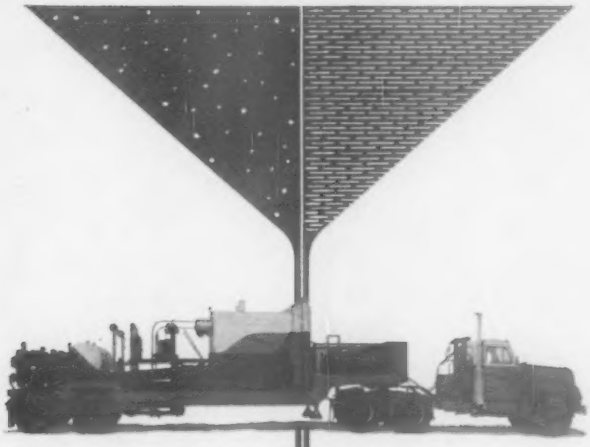
The royalty owners met on February 18, 1956, and Sohio presented its side of the case to them. Biggest selling point from the royalty owners' point of view was the increase in income. With the project, they would receive 3.5 times as much money in 15 years as they would receive by primary methods in 25 years. Sohio pointed out that the company was convinced the project would work and was willing to risk $2,250,000 on the project.

The application for the secondary-recovery project was filed with the

PRODUCING



UNIT IS DEFINED by faults and the oil-water contact. Two updip wells will be converted to gas-injection wells. Three flank wells will be used for water injection. Fig. 2.



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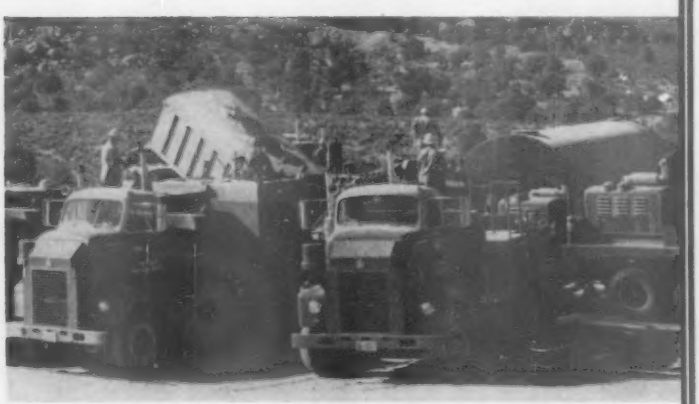

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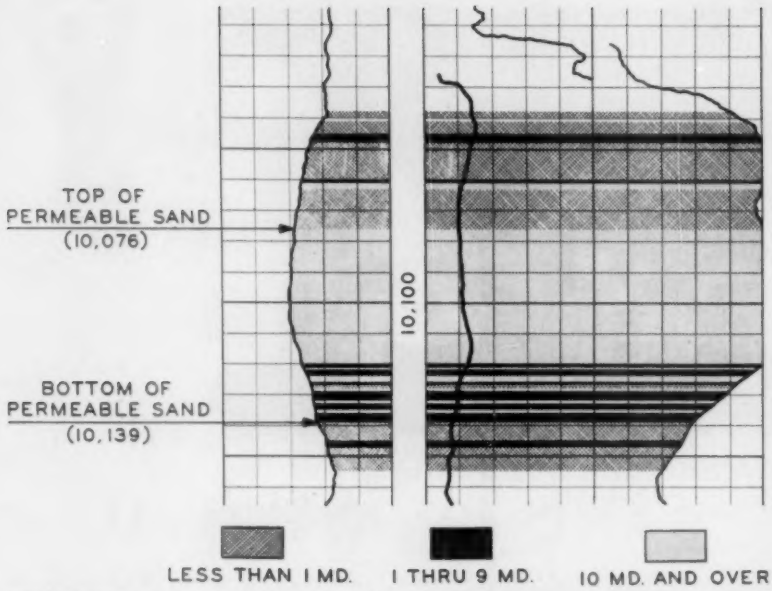

RESERVOIR in the unit is the Bromide sand. Here is a typical electric log and core analysis; average thickness of the zone is 89 ft. with an average porosity of 13.6 per cent. Fig. 3.

Oklahoma Corporation Commission early in April 1956 with 68 per cent of the royalty owners agreeing to the project. At the unitization hearing on May 16, 1956, over 80 per cent of the owners had agreed to the proposal. A minimum of 63 per cent is needed to secure the approval of the commission.

Deep injection wells . . . Under the plan, the Bromide reservoir on the south flank at an average drilling depth of 10,200 ft. is unitized. Sohio will convert two high wells in the field to gas injection (Fig. 1). One producer has been converted to water injection on the edge of the structure and Sohio is currently drilling a 12,200-ft. water injection well. Cost of this well is estimated at $325,000. A third water-injection well is planned (see map, Fig. 2).

The south flank of Eola is a separate fault block and it is this fault block that is unitized. Dips in the block range from about 45° to as much as 70° in the lowest wells on the structure. Because of the nature of the structure and the spacing pattern, most of the wells were drilled in the middle of the fault block. For this reason, the combined gas and water-injection project is the most economical and fastest means of recovering the oil.

A gas-injection project would require the drilling of additional downdip wells to recover the maximum amount of oil. A water-flood project would require expensive lifting costs during the late stages of production. However, by combining the two methods and carefully controlling the rates of injection of both the water and the gas, the reservoir can be drained effectively and economically.

Bottom-hole surveys invaluable . . . Bottom-hole pressures proved to be quite helpful in locating the faults and determining the limits of the reservoir. Since Eola was discovered in 1947, Sohio engineers have kept a close check on bottom-hole pressures. These data show clearly the approximate locations of the various faults at Eola.

Material-balance calculations enabled Sohio's engineers to determine accurately the amount of oil in place originally and the size of the reservoir.

Highest well on the south flank found Bromide at 8,462 ft. subsea and the lowest well, a dry hole, found the sand at 11,118 ft. subsea. This is 2,656 ft. of relief in a distance of just over ½ mile. The oil-water contact in the fault block was definitely established in the Sohio 2 Hodges at a subsea datum of 10,125 ft.

Producing zone . . . Although Eola has several pay zones, the principal producing horizon on the south flank is the Bromide sand (Fig. 3). The thickness of the productive Bromide ranges from 48 to 156 ft. and averages 89 ft. for the unitized area. The average porosity for the zone is 13.6 per cent.

Secondary recovery operation . . . The unitized area embraces 700 acres. Of this area, 399.16 acres lie within the productive limits of the reservoir. Present plans are to inject 3 M.M.c.f. of gas per day into the two gas-injection wells. This amount will be increased as needed. Initially, Sohio plans to inject 3,000 bbl. of water per day into the downdip wells. This will probably decline to about 1,000 bbl. per day after the injection rates of the water and gas are balanced.

Cost of the project is estimated at $1,250,000 plus an additional $1,000,000 in operating costs over the next 15 years. During the latter stages, lifting costs will be quite high since the wells will be producing large volumes of water. **End.**

BOOKS

PATENT NOTES FOR ENGINEERS by C. D. Tuska. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second Street, New York 36. 171 pp. $4.

This new edition erects clear warning signals for the engineer from conception of an invention to ownership of a patent. Case histories and court decisions are frequently quoted. Many actual patent illustrations, disclosure drawings, and sample application forms are included.

This well-known manual bridges the technical gap between engineers, research workers, and inventors generally, and their patent attorneys. It gives a clear idea of what patentable inventions are and how to protect them. Also it explains the relations of employer and employe in patent matters.

OFFICIAL REGISTRY OF RADIO SYSTEMS IN THE INDUSTRIAL SERVICES edited by Ethel V. Sleeper. Published by Communication Engineering Book Co., Radio Hill, Monterey, Mass. 152 pp. Paper back. $5.

A major addition—the listing by frequencies—appears in this edition. This registry was published by permission of the FCC and data were taken directly from official license files at Washington, D. C.

The registry is divided in two parts. One gives listings by companies while the other lists by operating frequencies. Listings include frequencies for: power-utility, petroleum and gas-pipeline, low-power industrial-plant, special industrial-plant, forest-product, relay, press, and motion-picture, and V.H.F. maritime units.

WYOMING GEOLOGICAL ASSOCIATION, ELEVENTH ANNUAL FIELD CONFERENCE, 1956, JACKSON HOLE. Available from Petroleum Information, Box 2612, Denver. 256 pp.

The Wyoming Geological Association has published another fine guidebook covering the geology of the Jackson Hole area. The guidebook contains many excellent papers on the stratigraphy including the Devonian, Mississippian, and Pennsylvanian. These latter rocks are potentially oil bearing in the Jackson Hole area.

The general structure and geologic history of Jackson Hole are adequately covered. Several of the more important surface structures are described and the results of recent drilling activity on these features are summarized.

The book is exceptionally well illustrated and contains several excellent stratigraphic and structural cross-sections along with regional and local geological maps.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Here's why Dowell M-38 (anti-swelling) ACID is called "the acid that will come back"

If the swelling of silicates, clays or bentonites has ever fouled up an acidizing treatment in your well, these graduated cylinders have an important story for you.

Both cylinders contained identical amounts of pulverized formation. The formation selected contained a high percentage of silicates and clays so swelling problems would be severe. Each sample received a small amount of crude oil to approximate the actual "in-place" oil saturation.

Then the cylinder at the right was filled with regular hydrochloric acid. The cylinder at the left was filled with Dowell M-38 acid. Both were thoroughly mixed.

After the acid had spent itself, the remaining formation was allowed to settle.

Notice how the formation in the regular acid has swollen — when compared with that in the M-38 acid. Notice, also, that less oil-in-water emulsion is formed when M-38 acid is used . . . two reasons why spent anti-swelling acid will come back faster.

What does this mean to you? It simply means that you can often get excellent production increases with anti-swelling acid in "dirty" formations that do not respond well to ordinary acid. In extreme cases, good results have been obtained in fields where ordinary acid had actually decreased production.

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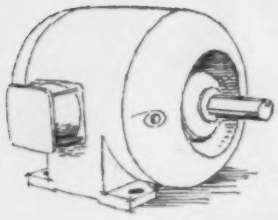
Five phases in Esso's program for motors . . .

- Weather-protected motors in sizes from 200 to 900 hp. are used in open areas of refinery tank fields.
- Use of modified dripproof enclosures for motors 1,000 hp. and above, usually located in freely ventilated refinery compressor houses.
- Use of totally enclosed fan-cooled motors throughout the refinery in lieu of explosionproof motors in sizes below 200 hp.
- Use of weather-protected motors in sizes from 200 to 900 hp. in process-unit areas as well as in refinery tank fields.
- Possible future use of dripproof motors in outdoor service, by application of moisture-resisting insulation.



Esso Designs to Eliminate Need for Explosionproof Motors

by Enoch Talley

IN studying the economics of new electrical motor-driver applications, every consideration should be given to the use of nonexplosionproof motors.

In the design of new units it is usually possible to eliminate the need for explosionproof motors by designing the units so that there will be no National Electrical Code Class I, Group D, Division 1 areas.

It is often possible to reclassify existing Division 1 areas to Division 2 by making certain changes such as removing portions of walls from a compressor house to provide adequate ventilation.

Experience with motors of the nonexplosionproof classification has been very good at Esso Standard Oil Co.'s Baton Rouge refinery. The potential savings are considerable, and thus far no sacrifice in reliability, safety, or service life is apparent.

Past practice . . . For many years it has been the generally accepted practice in petroleum refinery electrical design to use explosionproof equipment wherever such equipment was available. The Baton Rouge refinery of Esso Standard was among those following this practice.

As applied to squirrel-cage induction motors, this conservative attitude has a twofold purpose: (1) First, the prevention of ignition of possible explosive atmospheres surrounding the motor, and (2) the protection of the motor internals from the effects of the weather, since a large percentage of the motors were installed outdoors.

For many years prior to 1946 we had been making improvements to the refinery by installing better equipment, improving unit layout and providing better maintenance. After carefully reviewing the results of this work we concluded that many refinery areas could be reclassified. With rapidly increasing electrification of refinery operations at Baton Rouge it became apparent that a reclassification of certain areas might offer considerable savings without sacrifice or effectiveness of equipment operation.

Studies and tests of specific refinery areas conducted by our safety department over the past 10 to 15 years have indicated that refinery atmospheres which must be classified as National Electrical Code Class I, Group D, Division 1 are few in number and limited in scope. The recent release of A.P.I. Recommended Practice 500 has served to bolster our belief that squirrel-cage induction motors may be used in most refinery atmospheres without the requirement of an explosionproof enclosure.

With regard to protection from the weather, recent developments in motor-winding insulation and motor enclosures appear to offer considerable savings through use of less costly enclosures for motors to be used outdoors.

Changes in Practice

In the selection of industrial equipment, economics dictate installation of the least expensive unit which is suitable for the job. In the case of electric motors, consideration must be given to safety, reliability, maintenance, and life span, as well as first cost. Over the past 10 years we have taken advantage of the savings which were made available to us as we reclassified various refinery areas.

Our present practices in the use of

Author is with Esso Standard Oil Co., Baton Rouge, La. Paper presented at Petroleum Electrical Conference, A.I.E.E., Kansas City.

nonexplosionproof motors in the Baton Rouge refinery have developed gradually over the past several years. This development can be divided into five phases as follows:

1. The use of weather-protected motors in sizes from 200 to 900 hp. in open areas of our refinery tank fields.
2. The use of modified dripproof enclosures for motors 1,000 hp. and above, usually located in freely ventilated refinery compressor houses.
3. The use of totally enclosed fan-cooled motors throughout the refinery in lieu of explosionproof motors in sizes below 200 hp.
4. The use of weather-protected motors in sizes from 200 to 900 hp. in process-unit areas as well as in refinery tank fields.
5. The possible future use of dripproof motors in outdoor service, by application of some of the recently developed moisture-resisting insulations.

Motors in tank fields . . . About 10 years ago we planned to install several large motors sizes 500 and 600 hp. in some of our tank fields. After examination of the areas involved, we decided that tank field areas outside firewalls were nonhazardous and beyond the scope of National Electrical Code Article 500.

The most economical enclosure then available which appeared to be suitable was the splashproof type. Several of these were installed in 1947 and 1948. Our experience with splashproof motors for outdoor use proved unsatisfactory. All of these motors failed from water being drawn inside the enclosure with the ventilating air during rainstorms. In order to continue using these motors it became necessary to provide a housing over each one to protect it from the weather.

Because of this trouble we returned to the use of explosionproof motors for all outdoor applications until 1951, at which time we became interested in the newly developed weather-protected motor. The design of this motor appeared to be the solution to the problem which confronted us. At that time this weather-protected type of motor was relatively new and little was known about its ability to withstand long-term exposure to damp and corrosive air.

These motors had been subjected to a variety of spectacular tests; i.e., manmade hurricanes, squirting them with high-pressure fire hoses, and directing the spray from fog nozzles into the air intakes. Their ability to undergo such tests without getting water into the stator windings and their lower cost as compared to an equivalent explosionproof motor made them appear very attractive for outdoor use.

In 1952, we installed our first weather-protected motor in the refinery. Motors of this type have been used in both general-purpose and Division 2 areas. Since 1952 we have installed 25 weather-protected motors ranging in size from 200 to 900 hp. They are all 2,300-volt, three-phase, squirrel-cage induction motors operating at speeds from 900 to 3,600 r.p.m. These motors are of both vertical and horizontal types and all drive centrifugal pumps.

Some operate continuously and some are in intermittent service. All are located outdoors where they are subject to dust, rain, fog, and other weather conditions. Thus far we are well pleased with the performance of our weather-protected motors. In the past 4 years that we have used them, we have experienced no trouble with motor-winding insulation or other parts that might be subjected to more severe service conditions with a weather-protected enclosure than with an explosionproof enclosure.

Considerable savings are made through the use of weather-protected motors in place of totally enclosed fan-cooled (t.e.f.c.) and explosionproof motors. T.e.f.c. motors are 30 to 60 per cent more costly initially than equivalent weather-protected motors in sizes from 200 to 900 hp. depending upon size and speed. Explosionproof motors are 40 to 70 per cent more costly in the same sizes.

Compressor and Blower Drivers

Increasing use has been made in the last few years of motors sized 1,000 hp. and up as drivers for large centrifugal blowers and compressors.

One 1,750-hp. and two 4,000-hp. motors were purchased in 1953 for use in Class I, Group D, Division 1 areas. These were totally enclosed, inert-gas-pressurized (t.e.i.g.p.), water-cooled motors for installation in compressor houses. Unusual problems were involved in making motor installations of this type, such as selecting a suitable pressurizing medium and providing an adequate water supply for cooling. We feel that it is desirable to avoid using this type motor if at all possible since it has a number of disadvantages.

The initial motor cost and installation cost are higher than that of other motors. It is subject to emergency shutdowns for water cooler leaks and fouling of cooler tubes. During an inspection of our 1,750-hp. motor, its cooler was found to be fouled with wood chips from the cooling tower which served it. A 3,000-hp. motor of this design, located at another Esso refinery, failed as the result of a leak in one of the cooler tubes spraying water into the windings.

A number of control devices are necessary for the regulation of pressurizing gas and cooling water, each of which is a potential source of trouble. Because of the additional equipment involved, maintenance is generally higher than that for other types of motors.

We feel that the need for a motor of this type can be avoided by designing compressor houses so they can be classified Class I, Group D, Division 2 rather than Division 1. Our compressor houses built in recent years are of steel and transite construction, open on all four sides from grade up to about 8 ft. above the floors. Most floors are elevated several feet above grade and are made of subway grating.

Good ventilation is obtained by the free passage of air through the building which disperses any small amounts of hydrocarbon vapors that may be present from small leaks around packing glands, etc. The houses in which the three motors above are installed are of this type, and were reclassified as Division 2 locations in 1954.

Motors converted . . . In February of this year we converted our 1,750-hp. motor from t.e.i.g.p. to open-type self-ventilated. The necessary parts were obtained from the motor manufacturer and the actual work was done by refinery people. Necessary parts have been obtained for the conversion of one of the 4,000-hp., 13,000-volt. t.e.i.g.p. motors. This work will also be done by refinery forces. The other 4,000-hp. motor will be converted when the unit that it is associated with comes down for a turnaround early next year.

We have eight large induction motors in the refinery ranging in size from 1,000 to 4,000 hp. Two of these are 14-year-old explosionproof motors located outdoors. The other motors are located inside compressor houses classified Class I, Group D, Division 2 and are either of the dripproof type or are being modified as described above. For all new large motors to be located indoors in Division 2 and general-purpose areas we specify dripproof enclosures.

It is a common practice in the refinery to wash down compressor-house floors with high-pressure water hoses. In order to protect both personnel and equipment we feel that additional baffles or some other form of protection is necessary to prevent a water stream from being directed into the motor windings. Thus we specify that the motor enclosure shall be constructed to prevent water from striking the windings directly if a hose is accidentally directed on the motor during hosing-down operations.

We have recently installed two motors of this type, a 1,250-hp. motor to drive an air blower and a 1,750-hp.

motor to drive a centrifugal gas compressor. The 1,250-hp. motor is a boiler-feed-pump type of motor with air intake on both sides and discharge outlet at the top on the drive-shaft end over the end shield. Baffles are arranged inside the intake openings to protect against water being directed into the windings.

The discharge opening is high enough above the floor that the possibility of water splashing that high is unlikely. The 1,750-hp. motor has air intakes on both sides and air discharge through the bottom. Additional baffles were included at no extra cost to provide protection against hosing.

Engineering is presently in progress for the addition of five additional large motors, ranging in size from 2,000 to 9,000 hp. All of these motors will be squirrel-cage induction motors of the dripproof type and will drive centrifugal compressors located in Class I, Group D, Division 2 areas.

Motors below 200 hp. . . . As these applications of nonexplosionproof motors in Division 2 locations developed we continued the use of explosionproof motors below 200 hp. The basis for this was the fact that a totally enclosed fan-cooled motor was required in these sizes to get proper weather protection for outdoor service. Since the percentage savings which could be realized was small, it was felt that we should continue the use of explosionproof motors in these sizes to allow complete interchangeability of smaller motors between areas of different classifications.

We now feel, however, that the requirement for an explosionproof motor is the exception rather than the rule in refinery applications, and although the percentage savings are small, considerable over-all savings can be made by using t.e.f.c. motors throughout. Application of explosionproof motors will be limited to locations classified as Class I, Group D, Division 1. We have been designing on this basis for about 1 year.

About the same time that we started using t.e.f.c. motors we adopted use of weather-protected motors for larger installations on process units in areas classified as Division 2. At present engineering is in progress for the construction of a new process unit for which both weather-protected and t.e.f.c. motors have been purchased to drive the onsite process pumps. The savings realized on this unit alone through use of nonexplosionproof motors amounts to $15,000.

Use of open motors outdoors . . . According to motor manufacturers the new types of insulating materials available today for motor windings give longer motor life by providing added protection against moisture, foreign particles, corrosive atmospheres and the like.

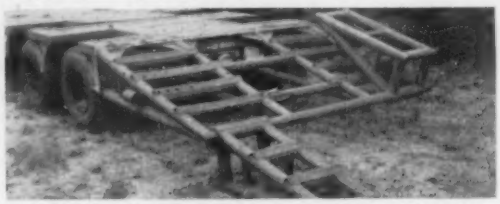
In connection with a plant expansion now being engineered, a 600-hp. dripproof motor was recently purchased to be installed outdoors. It has Class B silicone elastomer insulation and is a 60° C. rise motor. The manufacturer claims this motor is suitable for use outdoors and provides the same warranty as with a weather-protected motor. The requirement for this particular application was approximately 650 hp. Had a weather-protected motor been used it would have required a 700-hp. motor since its service factor is 1.00.

By using the dripproof motor we were able to use a 600-hp. motor as it has a service factor of 1.15. A weather-protected motor of the same size, made by the same manufacturer, would have cost 31 per cent more than the dripproof motor. A 700-hp. weather-protected motor made by this manufacturer would have cost 48 per cent more.

If this type of motor proves satisfactory for outdoor service, it appears that considerable further savings may be realized through the use of specially insulated dripproof rather than weather-protected motors. At least one other motor manufacturer offers a motor of the dripproof type with a special Class A insulation recommended for use outdoors.

Savings . . . The savings which may be realized through use of these precepts are considerable. For example, the 25 weather-protected motors we now have in service cost almost $100,000 less than equivalent motors in explosionproof enclosures.

ON THE JOB . . . . . IN THE PLANTS



Folding ramp helps load equipment

HEAVY equipment moves fast with this simple, strong loading ramp. Kansas-Nebraska Natural Gas Co., Inc., uses it to load tractors and ditching machines on trailers.

As shown, the lower sections fold back for moving. One man can fold the sections down to load or unload equipment. The folding sections form sturdy ground supports when lowered.

The ramp is made from standard 3-in. steel pipe and it is welded fast to the back of the truck bed. The hinge is made from 3½-in. pipe which fits over the 3-in. pipe.

Portable injector is easy to load

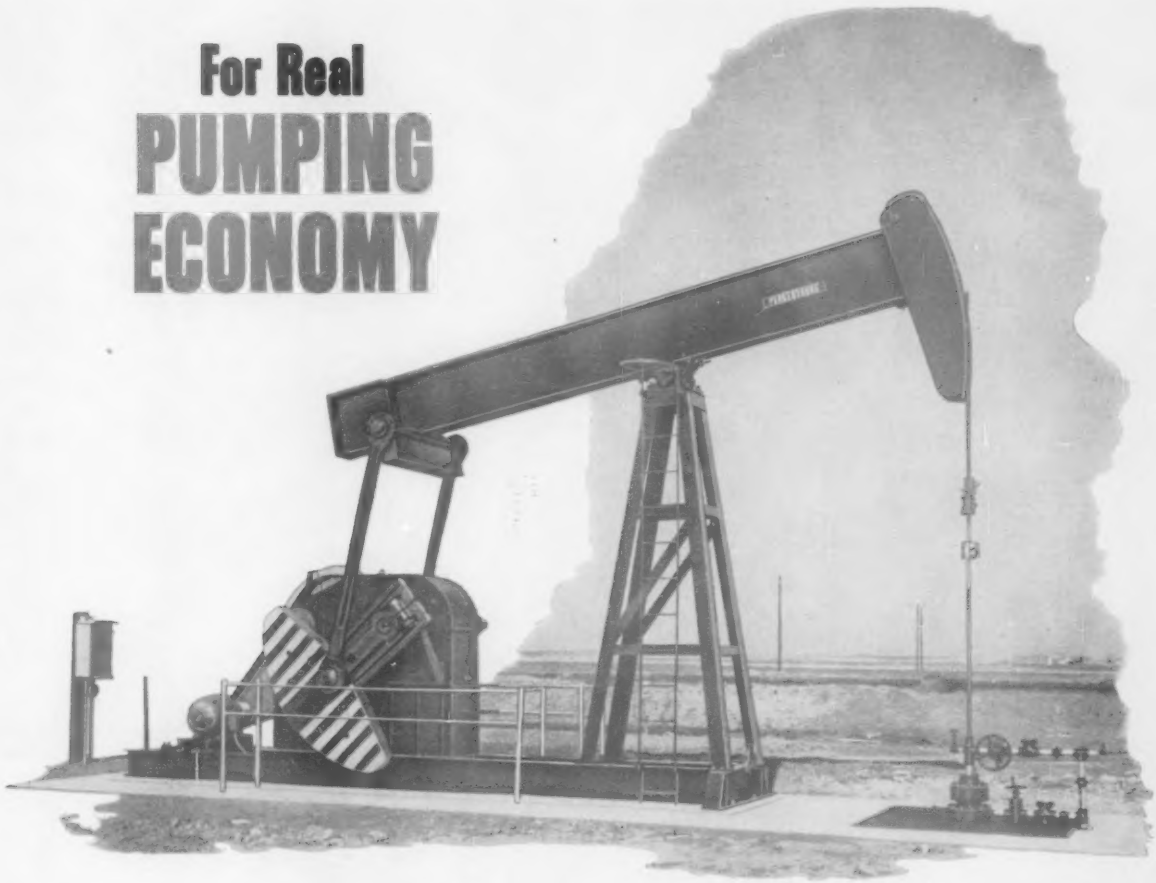
THIS chemical injector is handy for breaking emulsions on a lease. It is self-contained and easy to load. The stand supports a chemical drum at about the height of a pickup truck and the drum can be rolled directly onto the support from the truck.

On the front of the support a shelf holds the chemical feed pump and pump-supply tank. The drum is set so that the contents can be drained into the supply tank with no more effort than swinging the outlet nipple over the vessel and opening the valve.

Another feature of the unit is a built-in dust extractor for the gas powering the pump. It is on the front and consists of a length of 2-in. pipe plugged on either end with an inlet connection for the gas in the middle.

The bottom is tapped for a drain and the top is tapped to the pump drive. The top half of the pipe is stuffed with steel-wool shavings to extract any moisture and dust that may be entrained in the gas.

For Real PUMPING ECONOMY



A Parkersburg CHAIN DRIVE UNIT is first choice

There is a difference in pumping units . . . and the difference engineered and built into a Parkersburg chain-driven unit means real dollars and cents economy to you. Compare these plus values and you will see why more and more operators are making a Parkersburg chain-driven pumping unit their first choice:

- Rugged, dependable construction. Top-quality material and skilled workmanship combine for a big plus value.
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- Parkersburg chain-driven pumping units are available in double reduction models ranging from 25,000″ lbs. to 228,000″ lbs. peak torque rating.
- Plus superior field service. Parkersburg quality is matched with prompt, skilled service in every active field in the country.

Ask your Parkersburg sales engineer for more details.
It is the smartest pumping choice you can make.

At Parkersburg, quality and service have gone hand-in-hand for 60 years!

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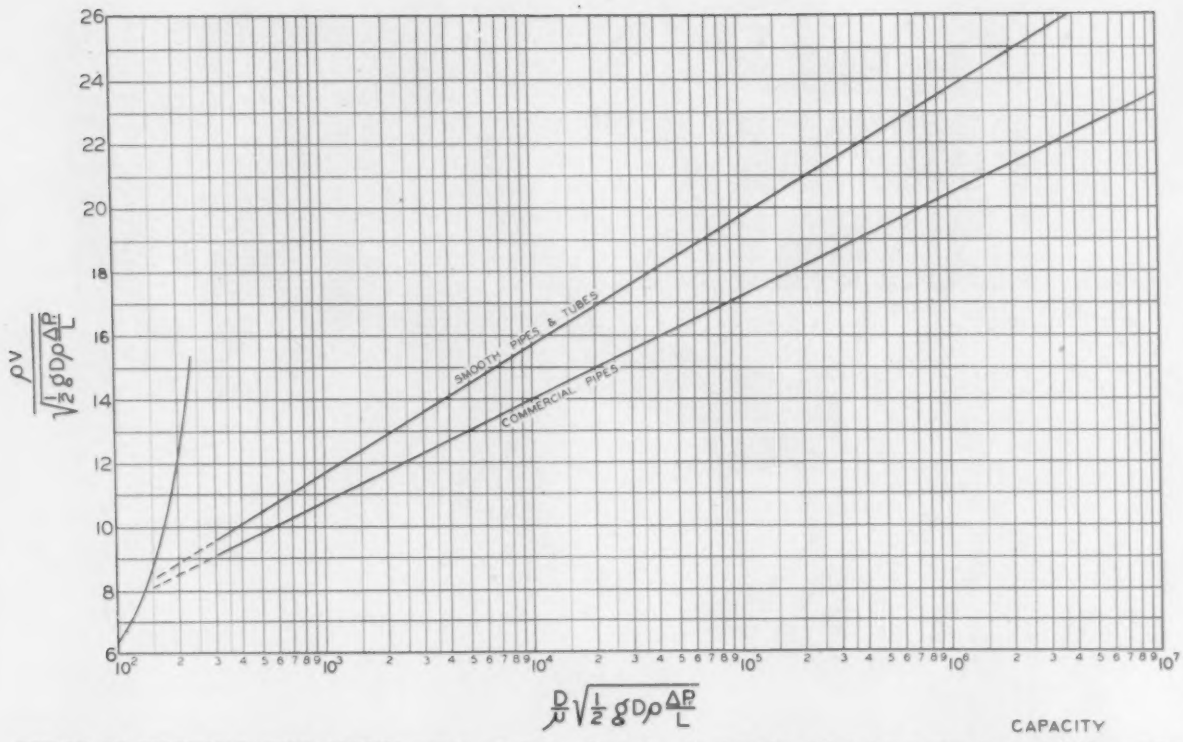


REPLOT OF FRICTION-FACTOR CURVES permits calculation of capacity of a given size of line when pressure drop and fluid properties are known. Re and f need not be determined. Fig. 1.

ELEMENTS OF FIELD PROCESSING—30

How to Calculate Liquid Line Capacity

by Dr. John M. Campbell

THE calculation of the capacity of a line, with a given pressure drop, is trial and error when using a plot of friction factor vs. Re. However, a direct solution is possible if the capacity is eliminated using the same procedure as that in Part 29. Therefore:

$$Q = \frac{\pi D \mu Re}{4\rho} = c\,Re \qquad (1)$$

and

$$Q^2 = \frac{\Delta P_f \pi^2 D^5 g}{32 f L \rho} = \frac{d}{f} \qquad (2)$$

when the friction factor and Reynolds number equations are solved for Q. The quantities c and d represent the known values in Equations 1 and 2.

Equating Equations 1 and 2 yields:

$$\frac{d}{c^2} = f\,Re^2 \text{ or } \frac{(d)^{1/2}}{c} = Re\,(f)^{1/2} \qquad (3)$$

Author is chairman, School of Petroleum Engineering, University of Oklahoma, Norman.

If the values of c and d are substituted in Equation 3 and the terms combined:

$$\frac{(d)^{1/2}}{c} = \frac{D}{\mu}[\tfrac{1}{2} D g \rho (\Delta P_f/L)]^{1/2} = Re\,(f)^{1/2} \qquad (4)$$

Fig. 1 has been developed using the relationship shown above and that which was shown between Re and f in Part 28. Fig. 1 is therefore exactly comparable to the f vs. Re correlation.

How to use chart . . . The capacity of a given line is found by solving the quantity on the abscissa, proceeding vertically to the proper line and then horizontally to the ordinate. The latter value may be solved for velocity v from which volume rate of flow Q is obtained. The curves shown for smooth and commercial pipe apply only for the turbulent-flow region and should not be extrapolated into the laminar region.

The approximate equations of the lines are:

For commercial pipe:

$$y = 3.28 \log x + 1 \qquad (5)$$

For smooth pipe and tubes:

$$y = 3.60 \log x + 1.2 \qquad (6)$$

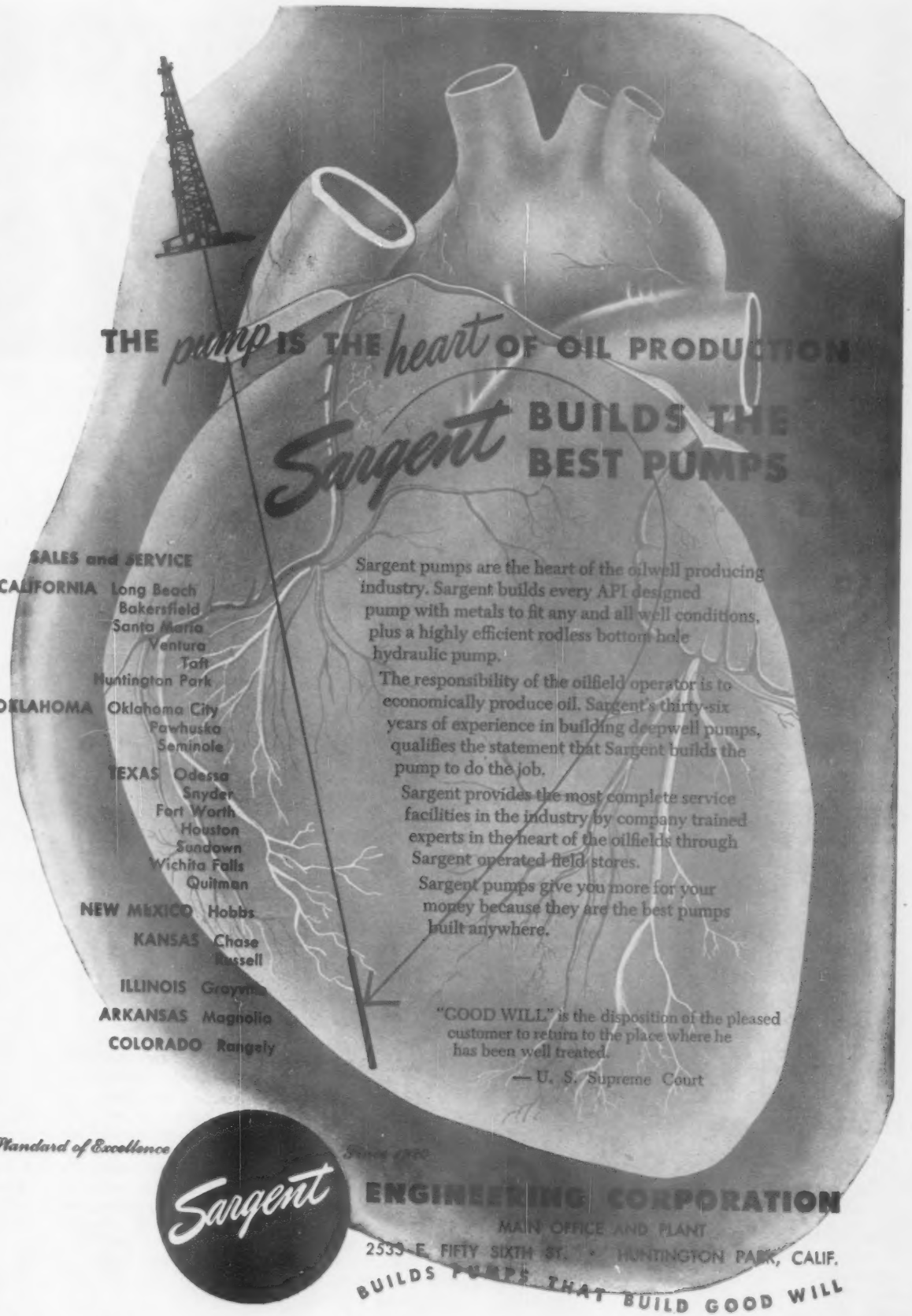
where:

$$y = \frac{\rho v}{[\tfrac{1}{2} g D \rho (\Delta P_f/L)]^{1/2}};$$

$$x = D/\mu\,[\tfrac{1}{2} D g \rho (\Delta P_f/L)]^{1/2}$$

Example: An 8-in. line is converted for crude oil use to handle 20.5° A.P.I. gravity oil with a viscosity of 46.3 cp. If the maximum working pressure is set at 600 psig. on this 18-mile line determine the line capacity if it dis-

FIELD PROCESSING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charges into atmospheric storage 385 ft. above the pump discharge.

Solution:

$\rho = [141.5/(131.5 + 20.5)]\ (62.4) = (0.93)\ (62.4) =$ **58 lb./ft.^{3}**

$\mu = (46.3)\ (0.000672) = 0.0311$ lb./ft.-sec.

$L = (18)\ (5,280) = 95,000$ ft.

$D = 0.673$ ft.

$\Delta P_f = (600)\ (144) - (58)\ (385) =$ **64,000 lb./ft.^{2}**

$$D/\mu\ [\tfrac{1}{2}\ D\ g\ \rho\ (\Delta P_f/L)]^{1/2} = \frac{0.673}{0.0311}\ [\tfrac{1}{2}\ (0.673)\ (32.2)\ (58)\ (64{,}000/95{,}000)]^{1/2}$$

$$= 0.673/0.0311\ (20.5) = \mathbf{4.43 \times 10^2}$$

From Fig. 1:

$\rho v/20.5 = 9.6$ or $v = 3.4$ ft./sec.

$Q = (0.785)\ (0.673)^2\ (3.4) = 1.21$ ft.^{3}/sec. = **18,600 bbl./day.**

The above method produces an answer as accurate as the f vs. Re correlation itself and thus may be used for rigorous pipeline design.

Pipe Roughness

In all of the preceding correlations the pipe-wall conditions have been taken into account only through the use of curves carrying the general designation of commercial and smooth pipe, in the turbulent-flow region. In the laminar-flow region pipe roughness has no significant effect. Through the basic work of Von Karman[1] correlations are available which embody the roughness factor ϵ/D where ϵ is the average depth of the pipe-wall irregularities.

It is then possible to plot f vs. Re with the quantity ϵ/D as parameter to get a family of curves. The apparent accuracy obtained by doing this is largely academic, however, when applied to field lines for even if an average value of ϵ is known for the pipe when new it will change with use as corrosion erosion, scaling, etc., take place. When this is added to the doubtful accuracy of being able to measure an average ϵ for pipe that has been sitting in a pipe yard and the unknown friction losses caused by welding, etc., the roughness correction has less application than might appear at first. The incorporation of roughness into small-plant process-piping design is a sound approach though.

The following are typical of ϵ for various types of pipe:

	ϵ (ft.)
Drawn tubing	0.000005
Steel or wrought iron	0.00015
Galvanized	0.0005
Cast iron	0.00085

Reference

1. Von Karman, T., Nach. Ges. Wiss. Gottingen Fachgruppe, I, 5, 58-76 (1930).

ON THE JOB . . . . . IN THE PLANTS

THIS 91-FT. TOWER, stainless steel and Monel Hortonclad, and other large reactors, crude towers, etc., are resistant to corrosion at temperatures to 1,000° F.

High-vacuum brazing has advantages

by R. C. Bertossa
Chicago Bridge & Iron Co.

SUSTAINED interest by the petroleum and other industries in vacuum-brazed clad products emphasizes the corrosion-resistant service this composite metal is extending. This material was announced only 1 year ago. It is called Hortonclad and has built up a solid background of experience under highly corrosive conditions.

Hortonclad is unlike other clad-materials in that the bond between the backing and the cladding metal is produced by a flux-free, high-vacuum brazing process rather than the usual sandwich rolling method. Among the cladding materials that have been successfully brazed to low and medium-carbon-steel backings are stainless steels (both chromium and chromium-nickel), nickel, and high nickel alloys such as Monel, Inconel and Hastelloys B and F. Fine silver vacuum-bonded to chromium-nickel stainless is one of the more special applications of this process that are now in service.

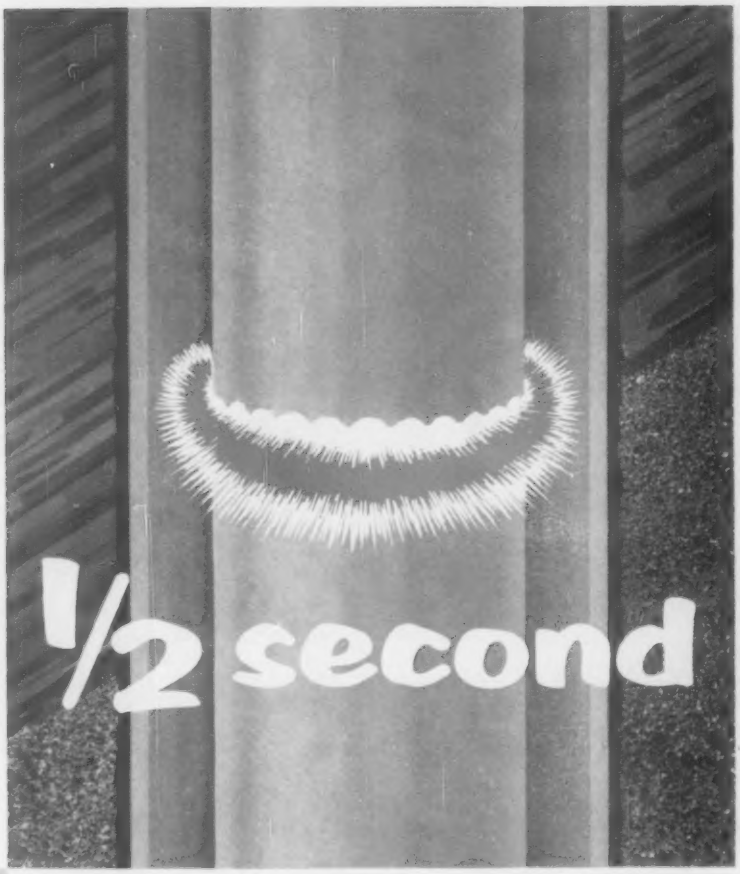
HASTELLOY B bonded to carbon-steel backing makes this section suitable for a urea stripper.

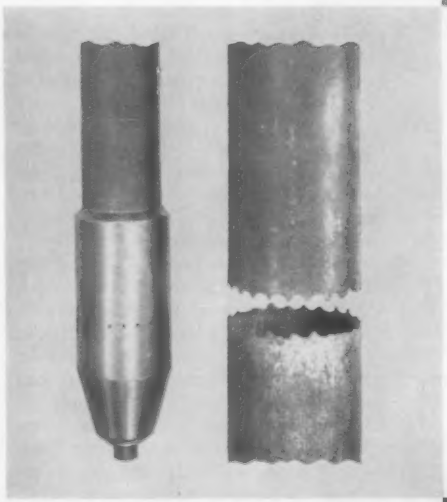
Vacuum brazing advantages . . . The primary advantage that high-vacuum brazing offers is a uniform thickness of the cladding layer. This cannot be offered in any other recognized process. Vacuum-brazing the clad material to the backing plate results in a high-strength bond and has no effect on the thickness of the clad or backing material. Thickness tolerances are governed only by those of the as-rolled alloy sheet or backing plate used in the process.

Full benefit is thus assured from the corrosion resistance of a uniform layer of clad metal. Uniform thickness of backing material is advantageous when the clad material is considerably weaker than the backing material.

A second advantage of flux-free vacuum brazing is its adaptability to the manufacture of practically any size or shape of flat-clad plate. Since little trimming to size is required after bonding, scrap loss for expensive and hard-to-dispose-of composite materials is kept to a minimum. The finished clad surfaces are bright and free from contamination. Their surface finish is identical with that of the alloy sheet before brazing.

Cuts Tubing in ½ second





Above, left—cutter head of the McCullough Chemical Tubing Cutter showing the orifices from which the chemical is ejected under enormous pressure, cutting the tubing in a fraction of a second.

Above, right—sample of 2½" tubing cut by Chemical Cutter. Note the absence of flare, burrs, or distortion of any kind on either the O. D. or I. D.

McCULLOUGH CHEMICAL CUTTER

This "split-second" Chemical Tubing Cutter applies the enormous power of the halogen fluorides, under closely controlled conditions, to cut through tubing in only ½ second. It will save more than 80% of the rig time usually required to cut tubing by mechanical methods.

McCullough's Chemical Tubing Cutter, run on an electric wire line, makes a clean, flare-free cut. It will not damage the casing even though the tubing be as close as ⅛". The entire operation is junk-free, since no part of the cutter is expendable.

This revolutionary new service will gain you a substantial saving in both time and money on that next tubing job—ask your McCullough Service Engineer. Available for 2" and 2½" tubing at all McCullough Service Locations.

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CONTROLLED by the operator from his station on the mutliple-arm unit, loading arms can be positioned quickly for flanging to ship's manifold.

Arm units speed up tanker loading

. . . Accident hazards reduced

THE trend to bigger tankers makes it necessary for marine terminals to speed turnaround time. A method being used at many terminals is to install hydraulically controlled loading arms in place of rubber hose.

These new devices not only cut loading and unloading time but also make for greater safety. Back injuries resulting from hose handling are eliminated. Accident hazards created by hose bursts are reduced and a cleaner working area is provided. Three multiple-arm units are now in operation or being installed. An extra 35 are under consideration. One of these calls for multiple units totalling 57 arms and some now in development have 16-in. diameter arms.

Lake Maracaibo has a channel dredged through sand bars. To handle the large-size tankers which now navigate there, Creole Petroleum Corp. is installing four multiple-arm units near Maracaibo, Venezuela. Each unit includes four 12-in. arms and one 8-in. arm.

Larger lines . . . Little apparently can be done to increase tanker-loading speeds through existing size lines by increasing pump pressures. Fittings on most tankers are rated for 125 psi. maximum. Use of larger size lines thus appears to be the logical solution.

What can be accomplished through change in line size alone can be seen from the following comparison of capacities: 8-in. line, 5,000 g.p.m.; 10-in., 9,000 g.p.m.; 12-in., 14,100 g.p.m.; and for a 16-in. line it is 25,500 g.p.m. These capacities are at a minimum pressure loss and they are for average conditions. Thus, a 16-in. line increases the flow rate more than five times the capacity for an 8-in. line.

. . . First installation of the new marine-loading arm was at Richfield Oil Corp.'s Long Beach, Calif., terminal. There three five-arm units are in operation. They were installed as part of a $5,000,000 remodeling program which resulted in three modern concrete-and-steel docks, capable of simultaneously handling two supertankers and a T-2. As shown in the picture, each unit consists of five 8-in. loading lines. They are cradled on top of a structural-steel frame which occupies 10 by 24 ft. of dock space.

Each arm consists of two lengths of 8-in. aluminum pipe coupled together by an aluminum ball-bearing swivel joint. A second swivel joint links one end of the arm to a dock riser which extends 15 ft. above the dock. Another joint, making possible simultaneous rotation in three planes, is welded to the free end of the assembly.

Each arm consists of two lengths of 8-in. aluminum pipe coupled together by an aluminum ball-bearing swivel joint. A second swivel joint links one end of the arm to a dock riser which extends 15 ft. above the dock. Another joint, making possible simultaneous rotation in three planes, is welded to the free end of the assembly.

The steel inserts make for maximum wear and easier joint rotation. At no time does the fluid flowing through the arm come in contact with the steel.

Hydraulic power is supplied by a 7.5 g.p.m. 500 psi. vane type of pump and a 3 hp. explosionproof motor.

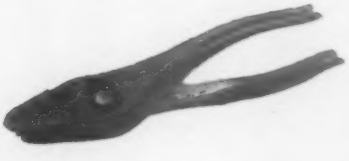
A boom and cam arrangement, using cables and a counterweight, is used to operate the arms. From the control station, the operator positions a selector valve opposite the arm which he desires to use. He then manipulates controls which raise the boom overhead and position the loading arm for flanging to the ship's manifold.

After the flanges are attached, power is removed so that the arm rides free. This allows for vertical movement and drift of the vessel as it rides at the dock. Loading operations can be carried out unattended after the unit is placed in free-wheeling. A test carried out on a single-arm unit installed at a New Jersey terminal offers an example of the speed with which the loading arm can be connected. Seven men, who knew they were being timed, required 24 minutes to make a single 8-in. rubber-hose connection. The arm hookup required only 7 minutes, with an operator at the controls and two men on the deck to make up the flanges. Less than 1 minute is required to lower the arm into position for making the connection.

The reduction in man-hours made possible by the speedier hookups has enabled one company to write off its 15-arm unit in less than 1 year. The operator is free to go about other business as soon as the flanges are made up and the pumps started. With rubber hose, slack must be periodically taken up or tension relieved as the tanker receives or discharges oil.

The safety factor provided in the all-aluminum arm is significant. Rated for an operating pressure of 300 psi., hydrostatic tests have been made safely up to 450 psi. in the 8-in. line. This is not a diminishing pressure rating for the metal line is built to last 25 to 30 years.

The new loading-arm arrangements are manufactured by Chiksan Co.



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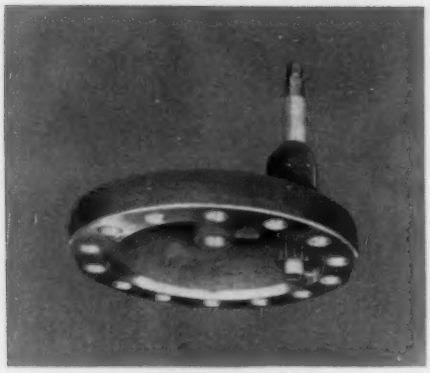
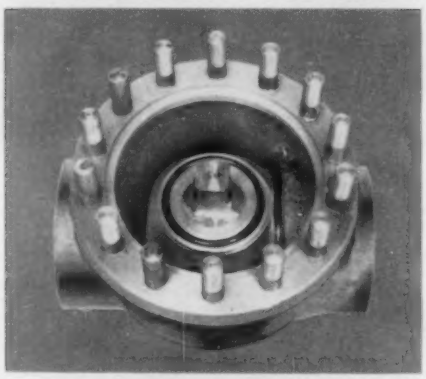


O RING MECHANISM SEAL IS BIG NEWS IN ORBIT DRILLING VALVES



Buna N "O" Ring is fitted into top of valve seating core, in a groove with larger area than "O" ring itself. This allows approximately 30% contact with underside of bowl retainer ring machined smooth for "O" ring to "ride upon." Sand, other abrasives and moisture cannot enter valve's operating mechanism and lubricant is retained in mechanism for longer periods of time. "O" ring resiliency permits pressure to hold ring securely rather than force it from groove.

Extensive field tests have proved that the Orbit Drilling Valve can take the toughest punishment under severest production service conditions.

Here's the big news on the new "O" Ring:

- Keeps Abrasives out of Bonnet
- Retains Grease in Bonnet
- Reduces Valve Maintenance
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Orbit Drilling Valves with the new "O' 'Ring feature are now available in 5½", 7" and 8⅝" sizes; working pressures, 500, 1,000, 1,500, 2,000 and 3,000 pounds. Flanged end, screw end, carbon trim only.

ASK YOUR ORBIT VALVE MAN ABOUT ECONOMICAL RECONDITIONING SERVICE ON ORBIT DRILLING VALVES, INCLUDING "O" RING SEAL MODIFICATION, FOR VALVE SIZES LISTED ABOVE. OR WRITE FOR NEW BULLETIN.

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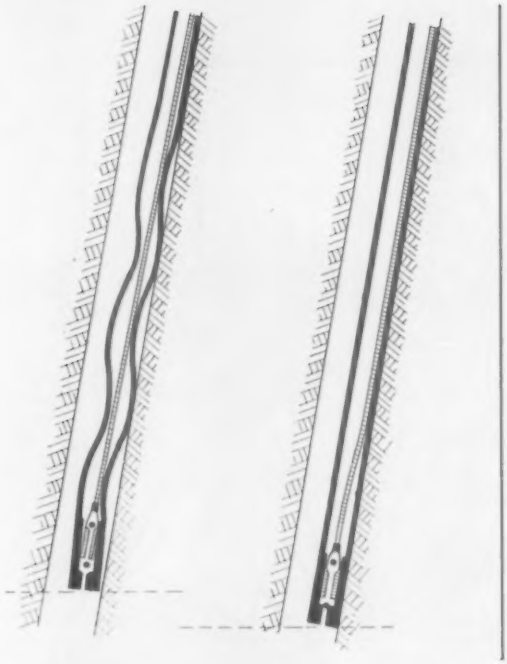
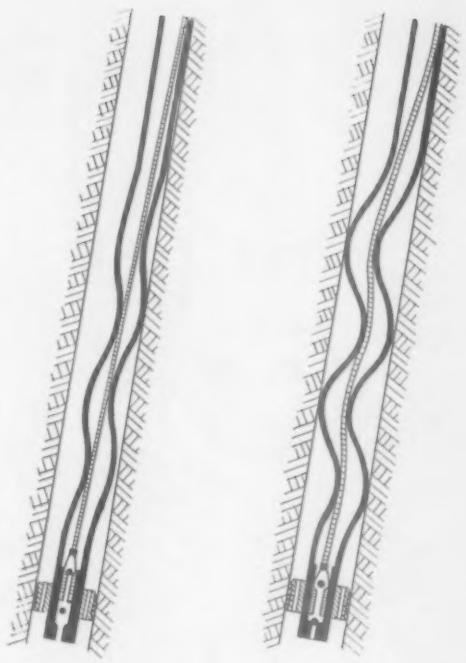


FREELY SUSPENDED TUBING buckles on the upstroke, left, and straightens on the downstroke, right. The amount of the helical buckling is restrained by the rod string which is in tension. Fig. 1.



COMPRESSION ANCHORS make the tubing buckle on the downstroke, right, as well as the upstroke, left. Since the rod string is under less tension on the downstroke, buckling is more severe. Fig. 2.

You Can Prevent Tubing From Buckling

Few people may be aware today that tubing buckles in pumping wells. The use of adequate preventive means is rare. Presented here are causes of buckling and accurate methods to prevent it.

FREELY suspended tubing in a pumping well alternately buckles and straightens during the pumping cycle. When compression anchors are used, buckling occurs not only below but also above the anchors. This latter buckling is even more harmful than buckling of freely suspended tubing. The result of buckling is rod-on-tubing wear, excessive polished-rod load and horsepower, and possibly increased pump wear.

Means of preventing buckling and its effects are tension anchors and heavy tail pipe. Sucker-rod guides and corrosion inhibitors (which lubricate rods moving on tubing) may minimize its effects.

Reasons for tubing buckling and the resulting cost to operators are clearly demonstrated in the Lubinski-Blenkarn paper "Buckling of Tubing in Pumping Wells, Its Effect and Means for Controlling It," given at the 1956 fall meeting of the Petroleum Branch of the A.I.M.E. in Los Angeles.[1] Laboratory models have confirmed the buckling action. Demonstrative models have been built by the research department of Pan American Petroleum Corp., Tulsa (where the phenomenon was discovered); by American Iron & Machine Works Co., Oklahoma City; and by Equipment Engineers, Inc., Dallas.

Practical charts from the paper for properly setting tension on tubing to prevent buckling are presented here.

Cause of buckling . . . Lubinski and Blenkarn show that buckling of a pipe may occur when it is subjected to internal pressure and one end is closed by a piston. In effect the pipe behaves as though it were subjected to a column load equal to the pressure differential across the piston times the piston cross-sectional area. Such a column load, if great enough, will cause buckling.

This situation will occur in all tubing string-rod pump installations in which the working fluid level is low. On the upstroke, the pump plunger bears the weight of the column of fluid being pumped and behaves like a piston, which causes the tubing to buckle. This is shown in Fig. 1a. On the downstroke, the weight of the fluid column is transferred from the rod string to the tubing, and the latter straightens as shown in Fig. 1b.

More severe buckling . . . A compression anchor permits the tubing to move upward freely but prevents downward motion. As a result, buckling occurs not only during the upstroke but also on the downstroke, as shown in Figs. 2a and 2b.

On the upstroke, the tubing buckles as if it were suspended freely. Note that the buckling is restrained by the

IT'S A SAFE BET!

In playing Blackjack – it's wise to stand at 15 if the dealer's exposed card is as low as 3, 4, or 5. If a dealer displays an ace, face-card, or nine, then a total of 16 should be hit.

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Dallas
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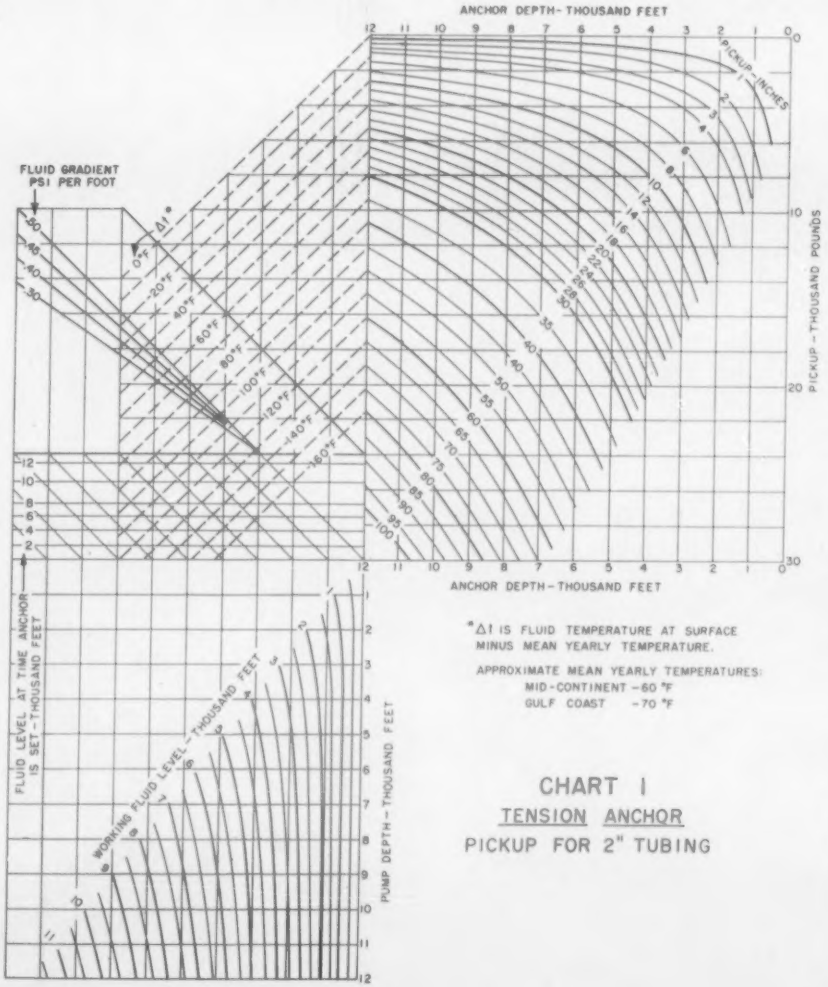
Parkersburg

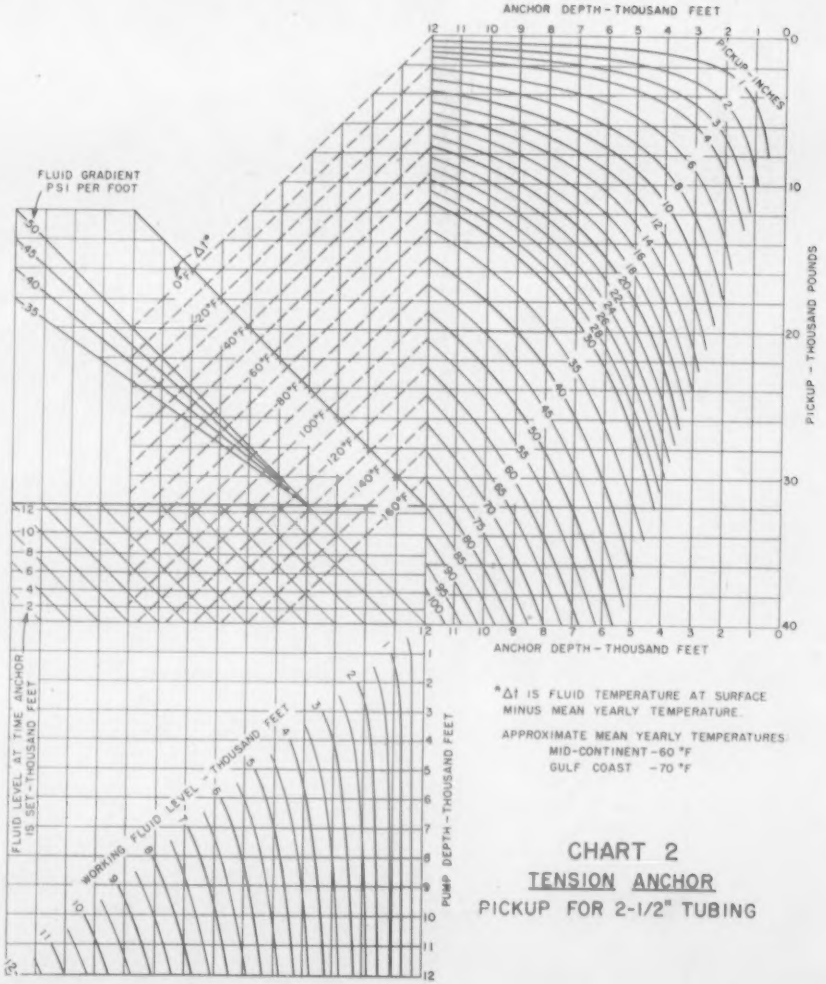
To prevent buckling, use these charts for setting tension anchors. When anchor is set, they tell how much distance and weight to pick up.


ANCHOR DEPTH - THOUSAND FEET
PICKUP - INCHES
FLUID GRADIENT PSI PER FOOT
PICKUP - THOUSAND POUNDS
ANCHOR DEPTH - THOUSAND FEET
FLUID LEVEL AT TIME ANCHOR IS SET - THOUSAND FEET
WORKING FLUID LEVEL - THOUSAND FEET
PUMP DEPTH - THOUSAND FEET

*Δt IS FLUID TEMPERATURE AT SURFACE MINUS MEAN YEARLY TEMPERATURE.

APPROXIMATE MEAN YEARLY TEMPERATURES:
MID-CONTINENT - 60 °F
GULF COAST - 70 °F

CHART 1
TENSION ANCHOR
PICKUP FOR 2" TUBING


ANCHOR DEPTH - THOUSAND FEET
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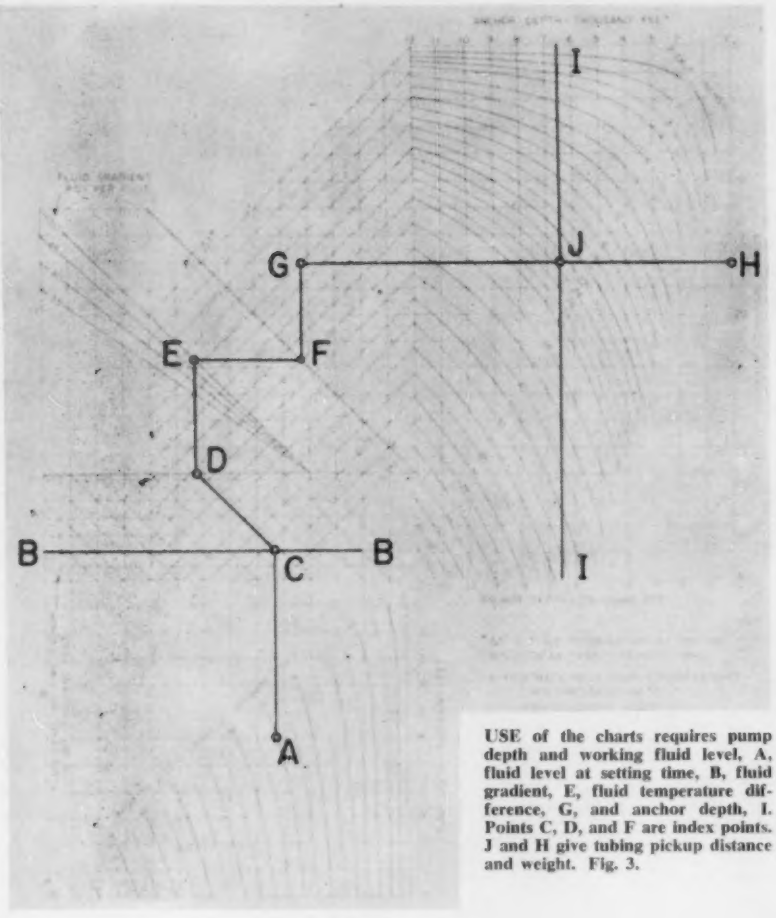
FLUID LEVEL AT TIME ANCHOR IS SET - THOUSAND FEET
WORKING FLUID LEVEL - THOUSAND FEET
PUMP DEPTH - THOUSAND FEET

*Δt IS FLUID TEMPERATURE AT SURFACE MINUS MEAN YEARLY TEMPERATURE.

APPROXIMATE MEAN YEARLY TEMPERATURES:
MID-CONTINENT - 60 °F
GULF COAST - 70 °F

CHART 2
TENSION ANCHOR
PICKUP FOR 2-1/2" TUBING



USE of the charts requires pump depth and working fluid level, A, fluid level at setting time, B, fluid gradient, E, fluid temperature difference, G, and anchor depth, I. Points C, D, and F are index points. J and H give tubing pickup distance and weight. Fig. 3.

"To prevent buckling on the upstroke, the tubing must be permitted to elongate freely on the downstroke but be prevented from shortening during upstroke. A tension anchor allows this elongation and prevents shortening."

rod string which is under tension. On the downstroke, however, the bottom of the string cannot elongate and the tubing remains buckled. But the sucker rods are no longer under great tension and buckling is limited only by the casing walls. This situation can result in frequent thread-bending failures and rod tension failures. It may be aggravated by large casing, corrosive conditions, and excessive setting slackoff.

Increased rod load . . . When the tubing buckles on the upstroke, it forms a helix which contacts the rod string over the entire length of the buckled portion (only the lower part of the string buckles). As the rods move upward there is friction between them and the buckled tubing. This increases rod load and pumping power.

Since the tubing is buckled while the rod string is straight, there is a tendency to cock the plunger in the pump barrel. This can increase pump wear.

Use of tension anchors . . . To prevent buckling on the upstroke, the tubing must be permitted to elongate freely on the downstroke but be prevented from shortening during upstroke. A tension anchor allows this elongation and prevents shortening.

Some tension anchors run on the tubing will work their way down to the most elongated position after pumping starts. Objections to this are the possibility that rust or scale will prevent proper slip operation or that the teeth may not hold fast when walking down and will damage the casing. To eliminate these objections the anchor may be set and then the tubing picked up at the surface to properly elongate it.

Charts 1 and 2 show how to correctly determine the amount of weight to pick up and the pickup distance for 2 and 2½-in. tubing strings. Variables are pump depth, working fluid level, fluid level at setting time, fluid gradient, temperature of fluid, and anchor depth.

Fig. 3 shows a sample calculation for 2½-in. tubing. Conditions are: pump depth, 6,000 ft.; working fluid level, 5,000 ft.; fluid level at setting time, 4,000 ft.; gradient (corresponding to a fluid of specific gravity 1.154), 0.5 psi. per ft.; tubing temperature at surface when pumping, 100° F.; yearly mean temperature, 60° F.; temperature difference (100-60), 40° F.; anchor depth, 6,500 ft. Solving the problem, go from A to C to D to E to F to G to J. Read the solution: weight pickup, 16,100 lb. (H); pickup distance, 23 in. (J).

The pickup in the charts is the effective pickup. One should add to it the pickup needed for the expansion of the anchor, which varies from make to make.

The fluid level in the well at the time the anchor is set is generally not known exactly. In such an event, this level should be estimated, assuming it too high rather than too low, so as to obtain a value of calculated pickup somewhat too large rather than too small.

Tail pipe . . . The advantage of tail pipe, compared to use of tension anchors, is the safety in retrieving the string. On the other hand, the disadvantage is that "breathing," which decreases pump efficiency, is not prevented. Breathing is the alternate shortening and lengthening of the tubing during the pumping cycle caused by the fluid head being carried first by the rod string, then by the tubing.

Although breathing is not prevented, addition of a tail-pipe weight equal to the plunger load will prevent buckling. A thick-walled pipe such as drill collars could be used to minimize the length of tail pipe. In determining tail-pipe weight, use weight submerged in well fluid.

With a compression anchor at the pump, the required weight of tail pipe is greater than for freely suspended tubing. This arises from the need to subject the tubing to more tension at anchor-setting time to avoid future thermal buckling when the tubing is heated by hot formation oil.

Reference

1. Lubinski, Arthur, and Blenkarn, K. A., Journal of Petroleum Technology, March 1957.

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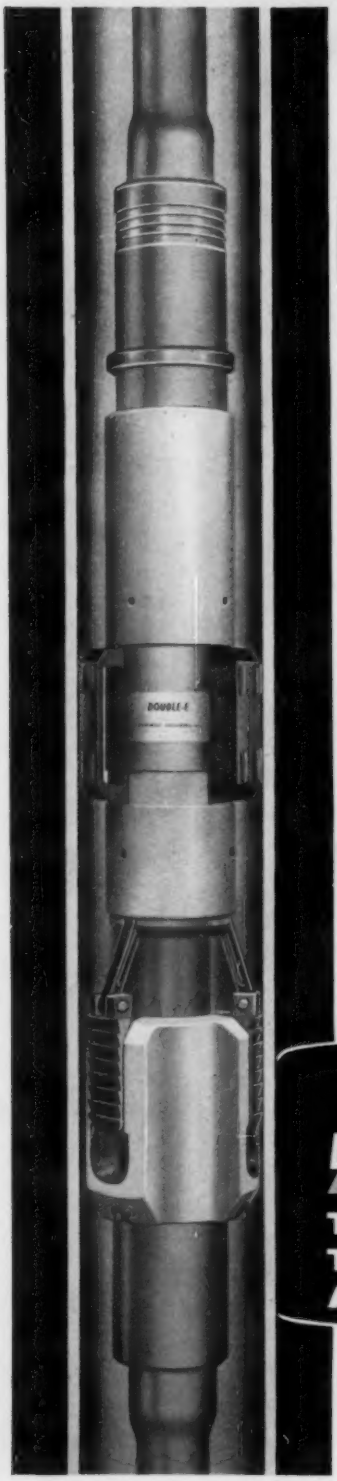


check these actual results of a Double-E Tension Tubing Anchor

BEFORE		AFTER
36 bbl oil per day	1957 Test	55 bbl oil per day
558 bbl water per day		630 bbl water per day
74% pump efficiency		85.5% pump efficiency
4 rod jobs in month		No rod jobs

Interestingly, this tension tubing anchor was run strictly to prevent rod jobs. Yet look what happened to pumping efficiency!

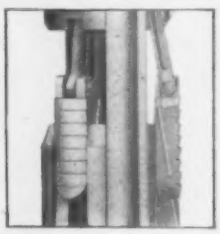
The Double-E Tension Tubing Anchor

HERE'S WHAT IT DOES: Efficiency in a pumping well increases tremendously when the tubing is correctly anchored in tension! Here's how:

1. You get more fluid lifted per stroke
2. Working life of tubing and rods is increased
3. Rod jobs are greatly reduced
4. Collar leaks and wear are eliminated

HOW TO USE IT: Install the tension tubing anchor above or below the pump – or at any desired depth. Set the tool by rotating the tubing a partial turn to the left. Then exert an upward pull on tubing string. The tubing is now anchored in tension.

HERE'S HOW IT WORKS: With its powerful grip on casing, tubing is now held motionless. This eliminates wear between tubing and casing. Also, with strain of load-reversal off the tubing joints, costly collar leaks and damaged threads are prevented. You get much more fluid lifted per stroke and an increase in working life of entire tubing string.



HOW TO RETRIEVE: Simply lower and rotate the tubing a partial turn to right and anchor is re-jayed. If re-jaying is impossible, merely exert a straight-up pull *in excess* of the Slip Failure Rating*. The Double-E Tension Tubing Anchor is designed so the slip-flanges shear upon excess pull. This releases the slips and the tubing string can be easily retrieved without loss of parts in the hole.

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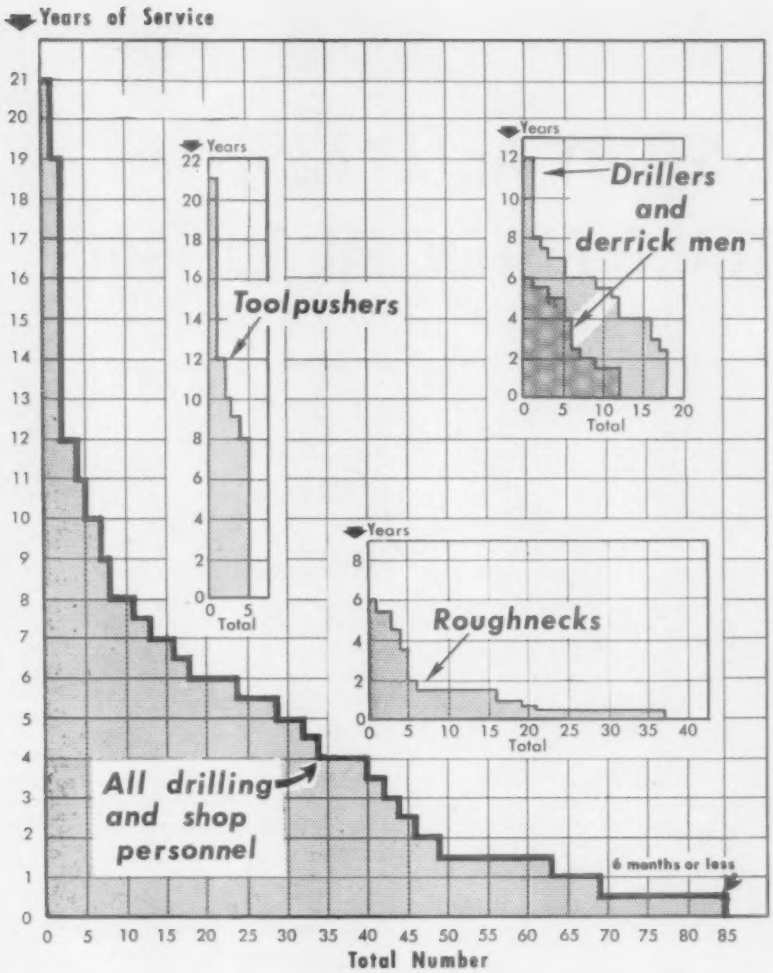


It takes more than good wages to hold drilling crews. Here's a remarkable record, which demonstrates that . . .

Drillers and Roughnecks Like Employe Benefits, Too

by J. O. Scott
District Editor

IN spite of good wages, most drilling contractors agree that holding their crews is a hard job. But one Oklahoma contractor, Glenn Gillespie & Sons, Cushing, is solving the problem. This company is establishing an unusual record of service from drilling and maintenance workers. Methods? Sound employe relations and permanent benefits. They include:

1. Annual 2-week paid vacation.
2. Promotion from within the company.
3. Company-paid insurance.
4. Company-paid retirement plan.

These benefits are common among most oil companies but they are almost new to the drilling contractor. He has relied on the high wages of a 7-day work week to attract drilling crews and he has been slow when compared to the rest of the industry to adopt employe benefits. Today contractors are caught in a cost squeeze. Drilling bids are being shaved, probably to their most competitive level. It is hard for contractors to raise wages to meet the rising scale throughout the industry. And even worse, the lack of security found in the drilling business causes labor to turn to other jobs.

True, the 40-hour week in other parts of the oil business pays less, but the time off, paid vacations, and security attract the oil man.

Results of employe plan . . . Contractors must recognize the trend toward more and better labor benefits. If they don't, they are sure to lose top-quality crews and drilling experience. Glenn Gillespie & Sons' efforts in this direction is shown in Fig. 1 which is a record of drilling employes' service. Six per cent have been with the company more than 10 years; 34 per cent more than 5 years. Half of the employes have more than 3 years in service.

Fig. 1 also shows that drilling men with the most service are tool pushers, next are drillers, then derrickmen and last, roughnecks. Gillespie uses four-man crews on each of its five rigs. Other long-term men are shop and warehouse foremen, mechanics, and welders.

Notice that length of service is in order of rank. This points out two policies of the company: (1) promotions are made from present company men, and (2) during down time or between jobs, seniority and employe benefits continue.

Getting ahead . . . Knowing he has a chance to work up within the company does help keep up the morale of each crew member. It helps him improve his work, practice safety, work more diligently, and plants the incentive to learn more about the jobs above him. With Gillespie, tool pushers are promoted from drillers, drillers from roughnecks.

Some crew members refuse to take advantage of their opportunity for promotion. This is true within any organization and with Gillespie some roughnecks are content to remain roughnecks. Others, more ambitious but with less service, can bypass the seniority line when this situation occurs. Naturally the man who has ambition and is able to get ahead generally becomes a permanent, loyal employe.

Although Gillespie does not have a formal training program for drilling crews, it takes advantage of the School of Drilling Technology sponsored by

ETHYL STUDY ANALYZES INDUSTRY OCTANE POTENTIAL TO 1960

New report can help in your future refining plans

by **C. J. WOLF**, Ethyl Corporation Refinery Technologist

Ethyl Corporation has undertaken this study to evaluate the effects of present and future refinery processes on the antiknock quality of the motor-gasoline pool in the United States.

The octane potential of the United States refining industry from 1955 to 1960 has been analyzed for the United States as a whole and, separately, for the various regions—East, Midwest, Gulf, Rocky Mountain, and West Coast. The effects of present and future refinery processes in general, and the catalytic reforming process in particular, have been the primary variables evaluated.

Secondarily, changes in crude type, the ratio of domestic-to-foreign crude run, and the composition and disposition of those products from petroleum that influence the quality and yield of gasoline have also been taken into account.

Influence of refining techniques

ETHYL studies indicate that the octane number of the total motor-gasoline pool in the United States increased by 0.9 Research octane number (RON) and by 0.8 Motor octane number (MON) from the fall of 1955 to the fall of 1956.

During this period, the portion of the U.S. refining industry utilizing catalytic reforming increased from 66 to 81 per cent (based on projected crude-running capacity). Total catalytic-reforming capacity, including spare capacity, increased from 10.6 per cent of crude run in 1955 to 12.9 in 1956.

Industry saturation of catalytic reforming in this country as a whole has been estimated at 16.0 per cent of crude run. This saturation is for virgin-naphtha feed only, and it is estimated that it will be reached in the fall of 1957.

Saturation of catalytic reforming is expected to take place by this time in all regions of the U.S. except in the Rocky Mountain region, where saturation is forecast for the fall of 1958.

The octane potential after the fall of 1957 will primarily be influenced by the severity of catalytic reforming, catalytic reforming of heavy thermal naphtha, aromatic extraction with raffinate recycle, and maximum use of alkylation for motor fuel after compliance with aviation-gasoline demand.

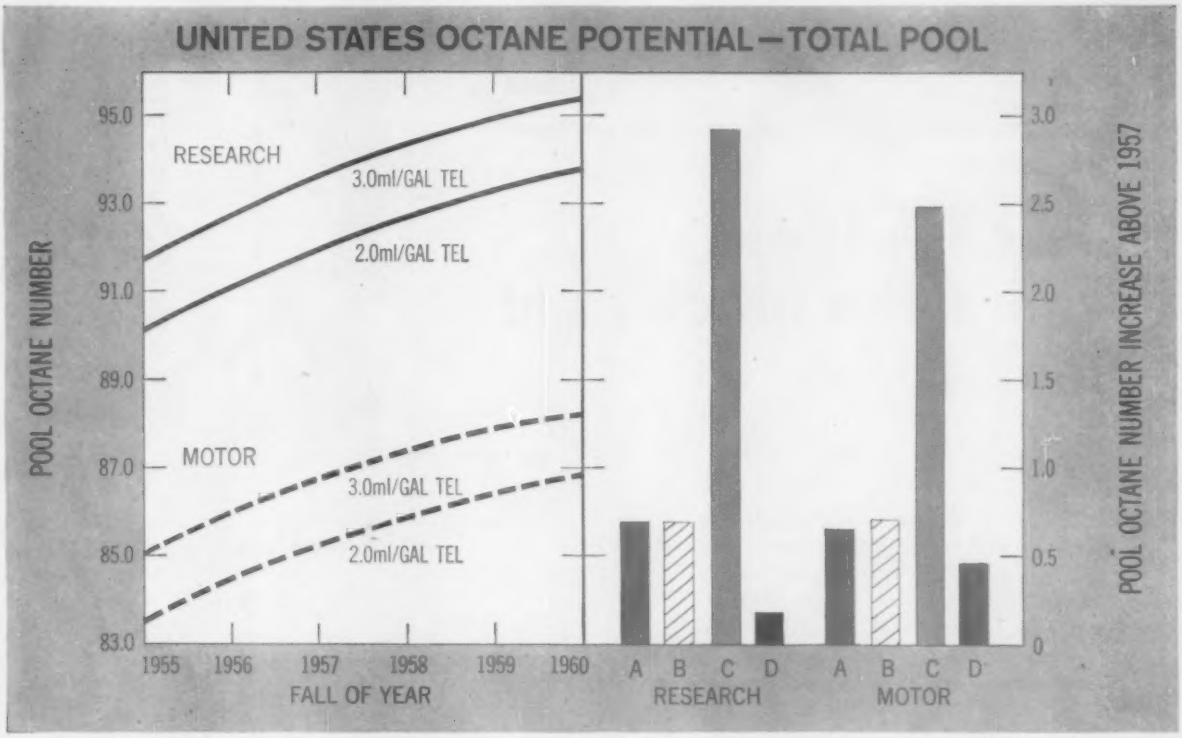
A summary of the catalytic-reforming growth in the United States is presented in the table below.

The effects of the growth or decline of refinery processes other than catalytic reforming during the 1955-1960 period have also been evaluated in this study. Growth is expected in catalytic cracking, catalytic polymerization, and alkylation in terms of percentage of crude run, during this period. In the same terms, decline is expected in thermal operations—visbreaking, coking, and thermal cracking.

CATALYTIC REFORMING

Per Cent of Crude Run

Fall of Year	1955	1956	1957
East	9.4	11.7	17.0
Midwest	11.0	13.1	16.9
Gulf	10.8	13.7	15.1
Rocky Mountain	1.9	7.2	11.9
West Coast	12.7	13.7	15.9
Total U. S.	**10.6**	**12.9**	**16.0**



The weighted regional-pool octane number potentials of total U.S. pool gasoline are shown from 1955 to 1960. The maximum octane increases obtainable from: **A.** increased reforming severity, **B.** reforming heavy thermal naphtha, **C.** aromatic extraction and reforming raffinate from straight run charge, and **D.** maximum alkylation are shown for the total U. S. gasoline pool. The weighted proportions of these refinery processes in use after 1957 were calculated from projected refinery economics.

Thermal reforming, with the exception of that planned for use in conjunction with catalytic reforming, has been considered to be non-existent when saturation of catalytic reforming of virgin-naphtha is achieved in 1957.

Increases after 1957

AFTER 1957, the maximum octane increase obtainable by more severe catalytic reforming, use of reforming capacity for heavy thermal-naphtha charge, aromatic extraction and raffinate recycle, and maximum alkylation will be about 4.6 RON and 4.2 MON for the total United States.

Depending on the region, this maximum potential octane increase can range from 4.2 to 5.2 RON and from 3.8 to 5.0 MON. The amount of this maximum potential octane increase that is actually employed by 1960 will vary from region to region.

Use of the above-cited refinery processes by 1960 could increase antiknock value of the total 1957 United States pool by about 1.7 RON.

The costs of octane improvement and local area conditions will dictate relative use of these more severe refinery operations.

In general, it is felt that increasing reforming severity to average a yield of about 80 per cent debutanized reformate will be almost universally employed throughout the industry by 1960.

The use of aromatic extraction and raffinate recycle and of catalytic-reforming capacity for heavy thermal-naphtha charge will be practiced by only one-third of the industry in 1960. It is believed that use of these processes will vary between 0 and 40 per cent, depending on the region.

Maximum alkylation above and beyond that required for aviation gasoline will be practiced by about 20 per cent of the industry as a whole, and in the various regions, with the exception of the Rocky Mountain area.

HOW ETHYL RESEARCH CAN HELP YOU

To assist refiners in obtaining the most economical routes to high-octane fuels, Ethyl Research maintains a close watch on trends in refinery processing. Recent studies of crude sources, processing and product yields provide a realistic evaluation of the octane potentialities of motor gasolines. The major findings are summarized for you here. A complete report entitled "U.S. Refining Octane Potential 1955-1960" is available through your Ethyl Representative.

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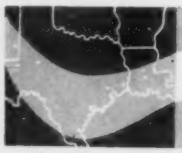
Call the ABI brine company nearest you and see how Ready-Made brine can save you time and money, too. With ABI you'll get three hour service wherever you are.



Associated Brine Industries

COMPANY	PRODUCING POINTS
Brine Service Div., Corpus Christi Salt Co	Beaumont, Tex.; Pine Prairie, La.
Brine Service Co.	Houston, Corpus Christi
Toland Brine Service, Inc.	Kermit, Tex.
The Brine Co.	Midland, Tex.; Hobbs, N. M.

A.A.O.D.C., which is held at Odessa, Tex., each year. Key men, tool pushers and drillers, are sent there alternately.

Retaining benefits . . . Shutdown periods are particularly critical times for holding drilling crews. When rigs are not working the crews become restless and most of the men will try other companies for work. If they do start working on another rig for some other contractor, ordinarily they will stay even when their original rig goes back to work.

For many companies this crew swapping works out provided the work is fairly steady in a given area. But a new crew takes time to become adjusted. The men must become acquainted with each other and with their new rig and of course their new company or contractor. As a result, the company may lose time and efficiency.

Gillespie's policy of continuing seniority and employe benefits during a layoff has had a big effect on bringing back crews after the layoff. Drillers and derrickmen in particular have a big incentive to return. This is shown in Fig. 1. When a rig is sold (Gillespie sold one recently) every effort is made to keep the men with the most experience. Sometimes drillers may have to drop back to roughnecking for a short time, but they keep their company benefits.

Even with this plan, drillers still hire their roughnecks. This continuation of the hiring tradition helps keep good crews together. Drillers usually have many years of seniority and experience, they understand roughnecks' problems, know which men are the best workers, and they are more likely to keep crews working for the company than the company itself.

Employe plans . . . Some drilling companies are using high wages alone to attract and keep personnel. Gillespie pays only average wages but uses fringe benefits as an added incentive. Since a man must continue with the company to keep his benefits, this plan is more important than high wages for promoting longer service.

Gillespie provides these benefits: (1) Annual 2-week paid vacation (based on a 40-hour week), (2) hospitalization insurance for the employe and his family, (3) life and disability insurance with a $2,500 minimum increasing with salaries, (4) weekly benefit accident and sickness insurance, and (5) retirement-assistance plan.

The employe does not pay any part of his salary for these benefits.

To be eligible for the paid vacation, an employe must work for Gillispie 1 year. For hospitalization and accident and sickness insurance, he must have 6 months' continuous service, and for life and disability insurace he must have 1 year of service. Retirement assistance goes into effect at age 65 or at the completion of 10 years of continuous service.

A trust is set up for administration of the retirement funds contributed by the company. At present, one of the trust-fund investments is the $100,000 modern office building which is the main headquarters for the company. Glenn Gillespie & Sons leases the building from the trust.

The Gillespie Employes Federal Credit Union is a great benefit to the employes. This organization allows employes to borrow money, up to $200, on their signature. The interest is reasonable—1 per cent per month on the unpaid balance.

Time off . . . The 7-day work week becomes more acceptable when employes receive some time off and a paid vacation. When a rig is down, lack of money may prevent the crew from taking a vacation but Gillespie's paid-vacation plan eases the money problem and provides planning time for trips. Under this plan, employes have proved to be more satisfied with their jobs. And most important to the company, they are less likely to look for another job.

Another long-standing company policy gives drilling crews time off twice a year in addition to regular vacation time. During the Christmas holidays, all crews are off from 3 p.m. December 24 until 3 p.m. Christmas. The second company-sponsored holiday is the annual picnic. All rigs shut down at the appointed time and crews gather in Cushing at the main office. Since Gillespie's five rigs usually work within a 100-mile radius of Cushing, gathering all crew members at one time is not difficult.

The annual picnic is a big morale booster. Employes and management have a chance to become better acquainted and it is ideal for making new employes feel adjusted within the company. Since loyalty comes with knowledge and understanding, the picnic helps make a better bond between employe and supervisor.

In addition to the picnic for better employe relations, Gillespie & Sons publishes a house organ called "Paydirt." This is published every 2 weeks and is distributed with pay checks. It contains personal items about employes, their families, location of rigs, and general company-policy information.

Insurance . . . Hospitalization and sickness benefits are very important to men who work on drilling rigs, probably more important to these men than any other personnel in the oil industry. The average drilling-crew member cannot obtain such insurance as an individual but it is available for company groups.

Gillespie pays the premiums for employe insurance. Otherwise many men would not participate in the plan. This protection takes the strain of worry from the employe when sudden family sickness or operations occur. And a good employe, if injured or ill, will return to the job more quickly when he is protected with such insurance.

Protecting employes' earning capacity is carried even beyond paid insurance in Gillespie's operations. If a crew member is hurt or disabled on the job, the company makes a place for him in its shop or maintenance crew when possible. Even though a man may not be able to roughneck, he can usually be useful in less-strenuous work.

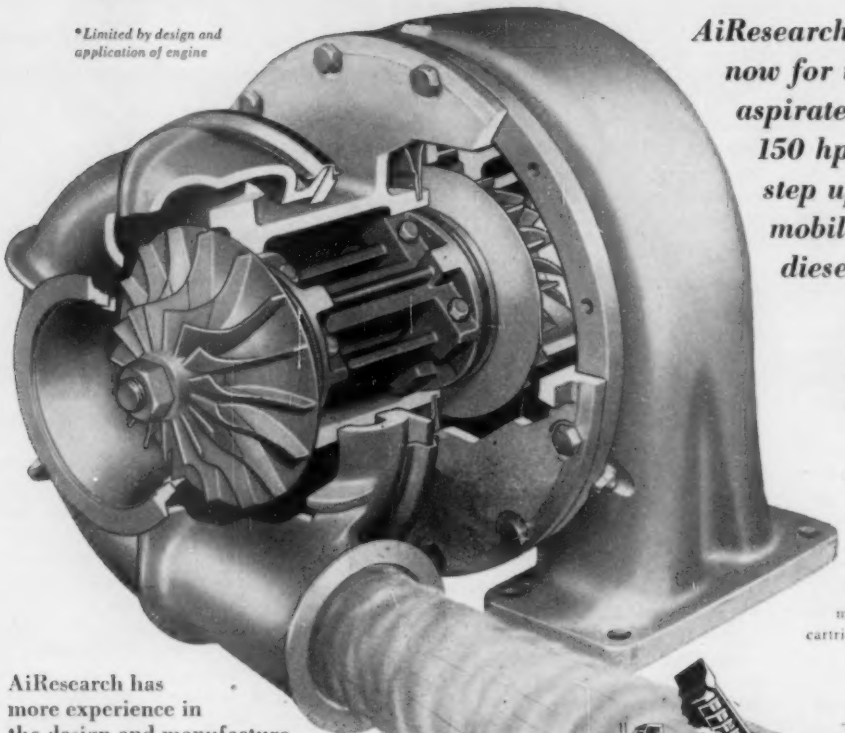
Company-sponsored safety programs do a good job in helping employes to protect themselves from hazards of the job. Gillespie has been very active in promoting safety among crews. (Don Gillespie is chairman of the national A.A.O.D.C. safety committee.) Results of one program, a contest between Gillespie's rig crews, showed 12 months' operation on one rig without a lost-time accident.

Better public relations . . . Giving the public a good impression of the oil industry depends on the drilling contractor in many cases. Most company contacts are made by the crews and Gillespie's crews have done a lot to foster good feelings with the public wherever the company drills. About three-fourths of the crew members are farmers and they understand the farmer and property owner's viewpoint. As a result, landowners seldom become dissatisfied or angry because of drilling operations and the entire oil industry benefits. **End.**

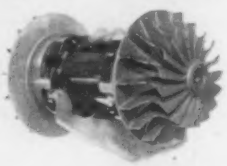
"Even with this plan, drillers still hire their roughnecks. This continuation of the hiring tradition helps keep good crews together. Drillers . . . understand roughnecks' problems, know which men are the best workers, and they are more likely to keep crews working for the company than the company itself."

AiResearch Turbochargers improve diesel engine performance up to 100%*

*Limited by design and application of engine



AiResearch units are available now for use with normally aspirated diesel engines of 150 hp and up. They step up performance of both mobile and stationary diesels, land or marine.



Removable cartridge simplifies repair and overhaul

This cartridge contains the turbocharger's rotating assembly, bearings and seals in a factory balanced package. It can be replaced in minutes with another factory balanced cartridge by a mechanic on the scene.

AiResearch has more experience in the design and manufacture of small turbomachinery than any other company. AiResearch turbochargers are the most efficient and safest units of their kind. New additions to the AiResearch family of turbochargers have widened their range of application in the diesel engine industry.

Our engineers welcome the opportunity to work with you in improving the performance of your diesel engines. We are happy to confer on applications of the turbocharger principle to your power plants.

AIRESEARCH TURBOCHARGERS NOW AVAILABLE

MODEL	T-10	T-15	T-16	T-30
Diameter — in. nom.	9	15¼	11½	15¼
Length — in.	9	16¾	15¾	17¼
Weight — lb.	39	125	100	135
Output — lb/min. (Standard Conditions)	25-40	35-65	45-65	70-95

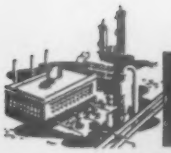
THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

Heat Transfer
Part 8



JOB IMPROVEMENT FOR THE PROCESS FOREMAN—82

What Causes Heat Exchangers to Foul?

HEAT exchangers may function improperly because of the following causes:

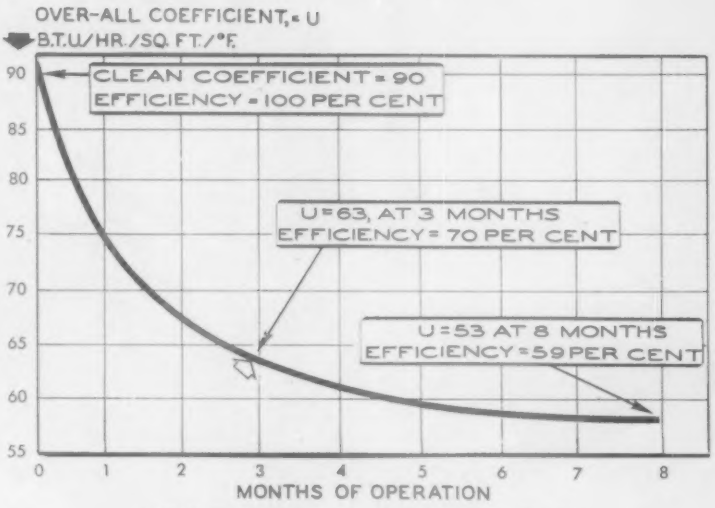
1. Air or gas binding due to the lack of venting.
2. Improperly connecting inlet and outlet piping with respect to flow.
3. Operation at pressures, temperatures, or flow rates not in accord with thermal-design conditions.
4. Excessive fouling in the exchanger.
5. Excessive clearances between baffles and shell and/or tubes due to corrosion.
6. Leaks in tubes or internal gaskets.
7. Improper drainage from the exchanger.

When operation of an exchanger appears to be impaired, the operator should first observe the manner in which the exchanger piping is connected to remove Items 1, 2, and 7 as causes. If unit operations fail to place the cause as Item 3, then the physical condition of the exchanger is the reason. Most usually, close corrosion inspection rules out Item 5 so that fouling and leaks are the cause. However, poor functioning of an exchanger can seldom be attributed to leaks. In most cases, excessive fouling of the transfer surface is the offender.

Because heat-exchange equipment is designed with calculated exactness, any degree of inefficiency can be measured. Knowing the design conditions, they can be compared with operating conditions. This is done easily by comparing over-all heat-transfer rates.

Flow fluid . . . To calculate the operating transfer rate, it is necessary that the flow rate of one fluid be known, the inlet and outlet temperature of both fluids, and the surface area. From these data, substitution in the equation, Q — UATm, will allow determination of the coefficient, U.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.



FOULING-RATE curve for heat exchangers. Fig. 8.

Upon comparison with the design coefficient, the efficiency is determined. Many refineries periodically make such a check of all exchangers within their plants and in this way establish a fouling rate. From this fouling rate the frequency of heat-exchanger cleaning is determined. An example of fouling rate curves is shown in Fig. 8.

Fouling of a heat exchanger may result from such causes as common refinery scale, catalyst fines, or particles lodging in the exchanger. Water residue may foul the tubes of coolers and condensers. Most usually, oil-side fouling material cannot be removed readily short of mechanical means. When this is necessary, the tube bundle must be removed. However, water residue can be removed without pulling the tube bundle from the shell.

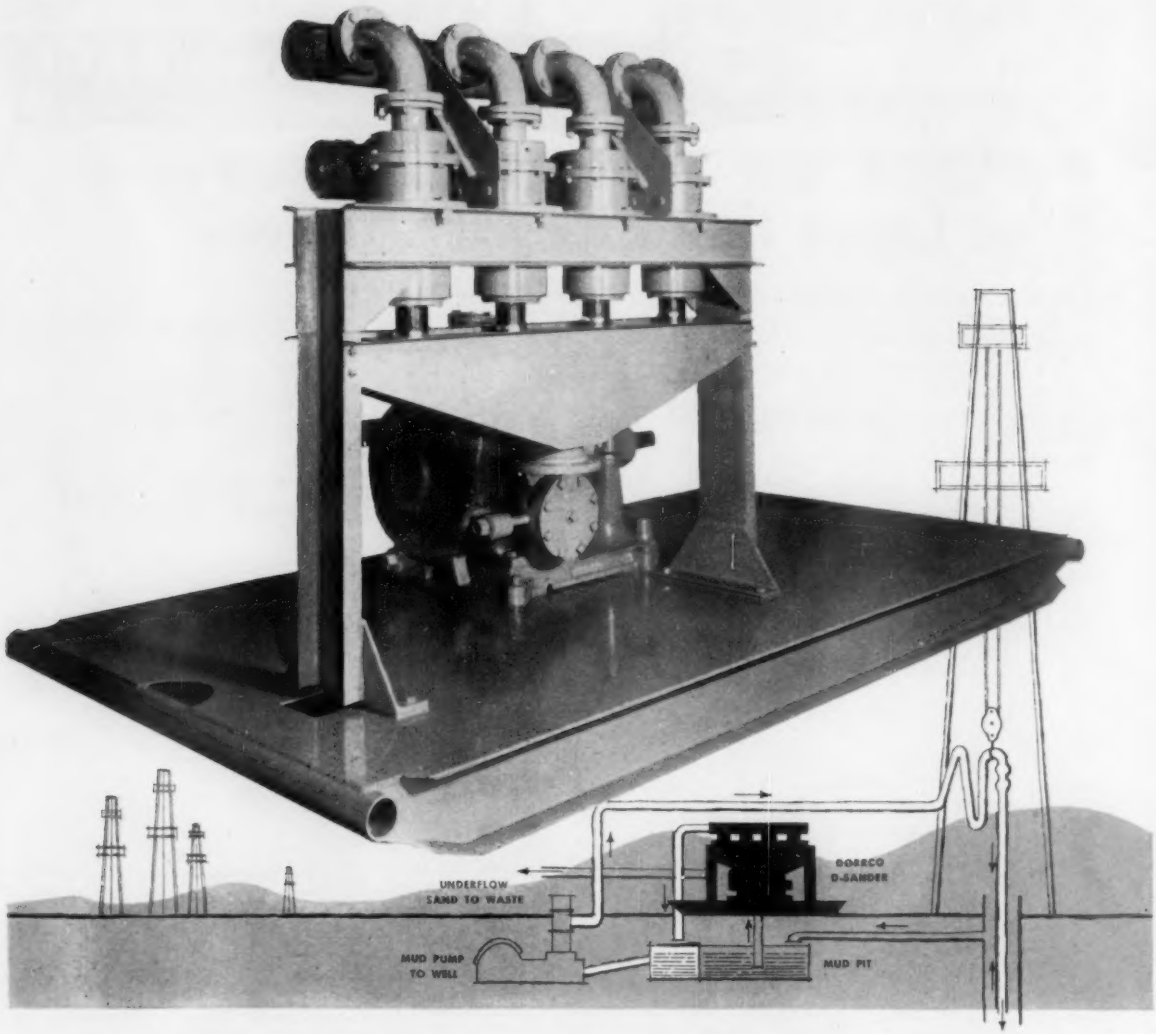
Water residue may be trash (roots, wood, fish, etc.), mud, silt, and/or scale (calcium carbonate). If the fouling material is trash, the use of backwash connections can substantially improve operating efficiency. By reversing the direction of flow momentarily, the force of the water will knock the adhering trash from the tube ends and remove some mud and silt from the walls.

Such an arrangement makes it possible to regain a degree of design performance without a shutdown.

Water-scale formation can be removed without dismantling the exchanger by utilizing chemical cleaning. This method of scale removal requires the cooler or condenser be out of service. Thorough cleaning is possible and very often can be accomplished in a minimum of time.

Water residue very often is removed mechanically and is accomplished by water jets or by drills through which water passes as a scavenging agent. Mechanical cleaning of oil-side scale can be done in a number of ways. In our refinery, drilling, steaming, and sandblasting are used to clean the tubeside.

Advances are being made continually in the field of exchanger cleaning and as improved methods are developed, industry is able to maintain its heat-exchange equipment nearer peak efficiency with less maintenance effort. The latest such development is a wet-sandblast machine that will efficiently clean both shell and tubesides of a tube bundle and return the bundle to an "as new" condition.



SIMPLIFIED MUD CONTROL

...with New Dorrco D-Sander

Solids build-up in drill muds is often aggravated by accumulation of hard-to-remove fine silty sands. This problem was solved in the Texas Panhandle by using a design variation of the proven Dorrco D-Sander. The new D-Sander, engineered specifically for *fine* or flour sand operations, will remove essentially all API sands and fine abrasive particles larger than 30 Microns. By removing undesirable solids from the drill mud system, mud weights can be closely controlled and aid in prevention of lost circulation.

In addition to maintaining lower mud weights, the Dorrco D-Sander will also reduce rig drill time, the number of bits used per well, and mud pump repairs.

U. S. Sales Representative for the Dorrco D-Sander: Salt Water Control Inc., 1211 Fort Worth National Bank Building, Fort Worth 2, Texas.

D-Sander is a Trademark of Dorr-Oliver Incorporated. Reg. U. S. Pat. Off.

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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
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by Dr. J. M. Ryan
The Datics Corp.

Using Electronic Computers in the Oil Industry — Part 6

Solving the Compressibility Factor

THE compressibility factor or deviation from Boyle's law is defined as:

$$Z = \frac{P}{d\,R\,T} \qquad (1)$$

in which P is the pressure, d the density, T the temperature, and R a constant depending on the particular units chosen for P, d, and T.

The variables P, d, and T are interrelated. Hence, in order to compute Z, it is necessary to have an expression which gives one of these variables in terms of the other two. One expression which may be used is the Benedict equation of state. This equation takes the form:

$$P = RTd + (B_o RT - A_o - C_o/T^2)\,d^2 + (bRT - a)\,d^3 + a\alpha\,d^6 + cd^3\,(1 + \gamma\,d^2)\,e^{-x} \qquad (2)$$

where $x = \gamma\,d^2/T^2$.

All terms but P, d, T, and R are constants determined by statistical methods.

Equation 2 is adequate to describe the relationship among P, d, and T in a pure hydrocarbon. In the case of mixtures it is necessary to replace the constants of Equation 2 with the weighted averages given in the following equations:

$$B_o = \Sigma\, x_i\, B_{oi} \qquad (3)$$

$$A_o = (\Sigma\, x_i\, A_{oi}^{1/2})^2 \qquad (4)$$

$$C_o = (\Sigma\, x_i\, C_{oi}^{1/2})^2 \qquad (5)$$

$$b = (\Sigma\, x_i\, b_i^{1/3})^3 \qquad (6)$$

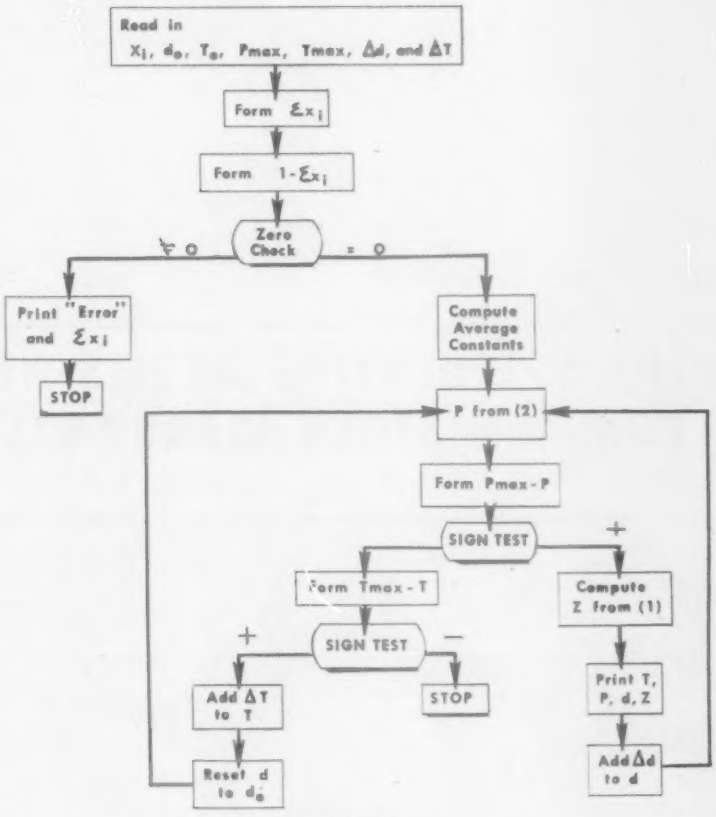
$$a = (\Sigma\, x_i\, a_i^{1/3})^3 \qquad (7)$$

$$c = (\Sigma\, x_i\, c_i^{1/3})^3 \qquad (8)$$

$$\alpha = (\Sigma\, x_i\, \alpha_i^{1/3})^3 \qquad (9)$$

$$\gamma = (\Sigma\, x_i\, \gamma_i^{1/2})^2 \qquad (10)$$

where x_i is the mol fraction of the ith component. The values of the statistically determined constants may be found in References 1 and 2.



Block diagram.

Once the weighted averages 3 through 10 have been computed, they may be substituted into 2. Equation 2 then may be used to compute P in Equation 1 at selected densities. Hence, Z becomes a function only of d and T. Selected values of T and d may then be inserted to obtain the deviation factor at desired increments.

Sometimes it is desired to compute the supercompressibility factor. This term is $Z^{-1/2}$ and is easily obtained in most stored program computers.

In the flow diagram, a typical problem is portrayed. It is assumed that Z is desired at equal increments of density, d, and equal increments of temperature, T, between the ranges P_o to P max and T_o to T max. In addition the sum of the mol fractions should be computed to determine if it is exactly 1.0. If not, the machine should print "Error," the value of $\Sigma\, x_i$, and then stop.

A later issue of PETROdatics will discuss the method of solving for density in Equation 2 given the values of P and T.

References

1. Benedict, M., et al., "An Empirical Equation for Thermodynamic Properties of Light Hydrocarbons and Their Mixtures," Chemical Engineering Progress, 47 (8), 419-422, August 1951.

2. Opfell, J. B., et al., "Application of Equations of State to Prediction of Hydrocarbon Behavior," Report of Progress, Fundamental Research on Occurrence and Recovery of Petroleum, 1952-1953, N. Y., American Petroleum Institute, 1955, p. 135.

$500 to $104,000

The story of *one* common stock Warrant, and how it happened.

The above profit was made by a $500 investment in one common stock *Warrant*. Such profits were made not only by an investment in *one* Warrant (the R.K.O. common stock Warrant, whose story we shall shortly tell) but also in the Warrants of Atlas Corp., Tri-Continental, Richfield Oil, Merritt-Chapman & Scott, United Corp. and a good number of others. *In all of the above* $500 investments during the past years, each grew to from $30,000 to $100,000. In the past year, indeed in the past months, new Warrants have again shown large gains and we should like to ask three questions:

1. Do you know what common stock warrants are?
2. Do you know why common stock warrants are issued?
3. Do you know how to keep abreast of opportunities in common stock warrants—when to buy warrants and when to sell warrants?

If you cannot affirmatively answer these three questions, we believe you will find it greatly to your profit to read:

THE SPECULATIVE MERITS OF COMMON STOCK WARRANTS

New 1957 Edition **by Sidney Fried**

Before we go any further, we should like to make one point clear. In every stock market period, the over-anxious investor is besieged by get-rich-quick promoters selling penny shares in gold, uranium and oil stocks, served up with the sensational promise of riches to come. These promises are almost invariably empty, their results to the investor sad and costly over the long run. Though the results attained by common stock warrants *are* spectacular, these results are a matter of record and this book, of which we are proud to be the publishers, has *nothing* in common with the above.

THE SPECULATIVE MERITS OF COMMON STOCK WARRANTS was first issued in 1949. Since that time, the book has been brought up-to-date three times, and favorable comment has multiplied. *Unsolicited* by the publishers, orders for the book have come in from heads of our largest corporations and some of the best financial minds in the country, *largely through recommendation by original readers*. Among its readers have been banks, insurance companies, and many of the largest investment firms. J. K. Lasser, the best-known tax expert in the country, has called this book "brilliant." The author of this work, Sidney Fried, has had a career including professional trader for investment firms, market analyst and financial writer for a well-known member firm of the N. Y. Stock Exchange, and is now recognized to be one of the most respected specialists in warrants and low-price stocks.

THE SPECULATIVE MERITS OF COMMON STOCK WARRANTS is a sober, well-grounded book which we believe can be invaluable to you, as an investor interested in allocating a portion of your funds for capital growth. Let us give you *some* idea of what is contained in the pages of this book by partial answers to our original questions:

1. What are common stock warrants?
2. Why are they issued?

To give a brief definition, common stock warrants are certificates issued by the corporation itself, just as bonds, preferred stock and common stock are issued, giving the warrant holder the right to exchange the warrants for common stock issued by the company itself, at a stated price, within a stated period of time, or with no time limit at all, some warrants being perpetual.

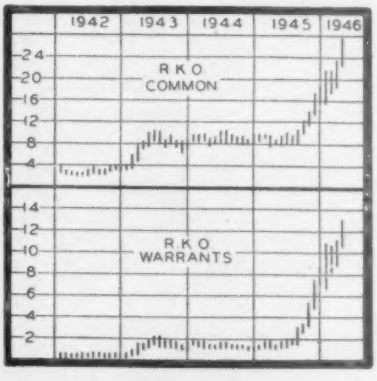
The Alleghany Corp. Warrant

A recent example: Alleghany Corp. *warrants* came into being in October 1952, are now listed on the American Stock Exchange, and give one the perpetual right to buy Alleghany common at $3.75 per share. How did this warrant come to be issued? A partial recapitalization for Alleghany Corp. was proposed in 1952 by which holders of 5½% preferred stock with back dividend accumulations of $116 per share were offered in exchange a new Alleghany Corp. bond *plus* warrants. Each $100 par share of the old 5½% preferred stock was to receive $100 par value of the new bond *plus* 20 warrants giving the perpetual right to buy 20 shares of Alleghany Corp. common at $3.75 per share. The warrants were offered as an *inducement* to the old preferred stockholders to exchange their claim to accumulated back dividends for a perpetual claim to Alleghany common stock—a claim which would become much more valuable should Alleghany common rise in market price. Preferred stockholders holding 100,000 shares of preferred stock accepted this plan and thus, 2,000,000 new Alleghany perpetual warrants were created and are now trading on the American Stock Exchange.

Demonstrating how important it is to watch common stock warrants, these new Alleghany warrants began trading initially around 75¢ when Alleghany Corp. common was selling at $3 on the N. Y. Stock Exchange. When Alleghany common advanced from $3 to $11, up 266%, the warrants (being the perpetual right to buy common at $3.75) went from 75¢ to 7⅞ on the American Stock Exchange. The warrants had advanced 950%, 3½ times as fast as the common. That is how *one* common stock warrant came into existence, and it is a fact that most warrants come about through reorganizations or issuance of new bonds or preferred stocks to which common stock warrants are attached and, after issuance, traded separately. Common stock warrants possess, inherently, such a high potential, that they should always be foremost in the mind of an investor interested in capital appreciation. To see why, here is the story of the long-term warrant which produced our heading—$500 to $104,000 in 4 years—the R.K.O. common stock *warrant*.

The R.K.O. Warrant

In 1940 the Radio-Keith Orpheum Co. (R.K.O.) reorganized after some years of bad fortune. The old common stockholders seemed to fare badly. For each old share they received only 1/6th share new common stock *plus* one warrant, good to buy one share of new common stock from the company at $15 per share. In 1942 R.K.O. common was selling at a low of 2½ and with general pessimism rife, the chance of R.K.O. common ever selling above $15, at which point the warrants would begin to have some actual value, seemed slim. R.K.O. warrants were, therefore, selling on the N. Y. Curb Exchange at only 1/16 or 6¼¢ per warrant. How the picture changed in 4 years! As can be seen from the chart, R.K.O. common stock advanced to a high of 28⅛ on the New York Stock Exchange. Now, the right to buy R.K.O. common at $15 per share from the company when it is selling at $28 per share on the open market must be worth $13, and the warrants did sell exactly at $13 on the N. Y. Curb Exchange. *That* is the story of the R.K.O. warrant—$500 invested in these warrants



in 1942 was worth *$104,000* just four years later.

Why is the common stock warrant so uniquely a potent vehicle for capital appreciation? The answer is given in a simple mathematical fact.

in 4 Years

PLEASE NOTE: you may find special interest in the Oil and Gas Warrants included in the list below.

Between 1942 and 1946 R.K.O. common *stock went from $2.50 to $28:*
Therefore, a $500 investment appreciated to $5,625.
Between 1942 and 1946 R.K.O. warrants *went from 6¼¢ to $13:*
Therefore, a $500 investment appreciated to $104,000.

The warrant had appreciated *20 times* as fast as the common stock.

As is evident now, the common stock warrant is a low-price call on the future of the company, and at times *even on the future of an industry.* Such an opportunity arose in past years with a great new industry of limitless potential—television. The rapid growth enjoyed by some small companies, as distinguished percentagewise from the giants such as R.C.A., General Electric and Westinghouse, is illustrated by the leaping sales of Hoffman Radio, a West Coast producer of television, radio and special electronic apparatus. Those sales went from only $29,764 in 1941 to $5,112,889 in 1948 and soared to $29,580,510 in 1950.

The Hoffman Radio Warrant

The results were to be anticipated. The common stock which sold at a low of around 1¼ in 1948 was showing *earnings* of about $7 per share two years later and was selling near the $30 mark. There were common stock *warrants* outstanding in the Hoffman Radio capitalization giving the right to buy common at $4 per share. In 1948 the best bid indicated by the records for these warrants was 5¢ per warrant. Within two years the warrants were $25 bid. *Based on these prices a $200 investment in Hoffman Radio warrants was worth $100,000 two years later.* The same $200 invested in the common stock would have appreciated only to $4,800. Again the warrant had appreciated more than 20 *times* as fast as the common.

To widen the picture even more, the years 1952-1956 saw a remarkable trend develop towards issuance of long-term warrants with the result that *former* opportunities in warrants have multiplied to the extent that they can no longer be ignored by any investor interested in capital appreciation. Below is a list of 123 warrants now outstanding, many actively trading today, many more of which will be actively trading in the months to come, and *all of which* can greatly reward your active interest.

A Current List of Common Stock Warrants

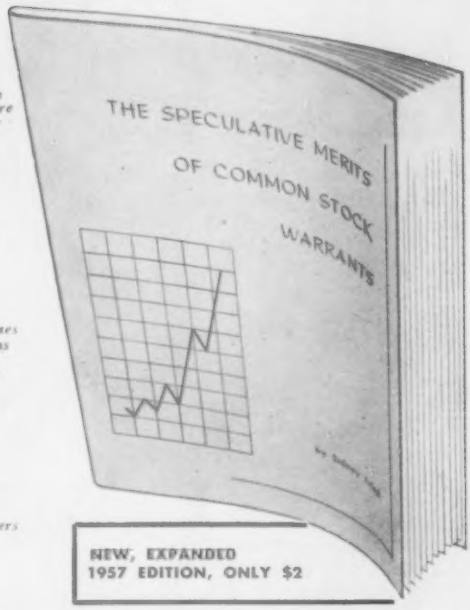
Alleghany Corp.
American Alloys
Amuranium Corp.
Anchor Precision
Armour Co.
Associated Oil & Gas
Atlas Corp.
Atlas Plywood
Baird Associates
Black, Sivalls
Charmin Paper Mills
Chief Consol. Mining
Colonial Sand & Stone
Colorado Oil & Gas
Consumer Acceptance
Crampton Mfg. Co.
Crowell-Collier
Dakamont Exploration
Danly Machine
Disney (Walt)
Doman Helicopters
Duriron Co.
Fibreboard Paper
Foremost Dairies
General Acceptance
General Credit
General Tire & Rubber
Genung's, Inc.
Glen-Gery Shale Brick
Gulf Sulphur
Haile Mines
Hewitt-Robins
Holiday Plastics
Home Improvement
Invest. Co. of America
Kawecki Chemical
E. J. Korvette, Inc.
Liberty Baking
Lunn Laminates
Lynch Carrier Systems
Mack Trucks
Magna Theatres
Glenn L. Martin
Meteor Air Transport
Mexican Gulf Sulphur
Missouri Research Labs.
National Propane
Nortex Oil & Gas
North Amer. Royalties
Northeastern Steel
Ocean Drilling & Ex.
Orradio Industries
Pac. Coast Aggregates
Pan American Sulphur
Panhandle Oil
Peabody Coal
Pub. Service of N. C.
Pyramid Electric
Raytheon Mfg.
Regal Plastics
Ritter Finance
I. Rokeach & Sons
Servo Corp. of Amer.
Sheraton Corp.
So. Georgia Natural Gas
Southeastern Fund
Standard-Thomson
Stubnitz Greene
Suburban Gas Service
TMT Trailer Ferry
Tekoil Corp.
Texas National Petroleum
Tri-Continental
Ultrasonic Corp.
U. S. Air Conditioning
U. S. & International
U. S. Sulphur & Chem.
Van Norman Co.
Vendo Co.
Victor Products

Canadian Warrants

Algom Uranium
Bicroft Uranium
Canadian Husky Oil
Canadian Oil Cos.
Canadian Pipelines
Canam Copper
Central Explorers
Consol dated Denison
Consolidated Fenimore
Consol dated Finance
Cree Oil of Canada
Crestbrook Timber
Decoursey-Brewis
Edmonton Concrete
Faraday Uranium
Fruehauf Trailer (of Canada)
Great Northern Gas
Gunnar Mines
Hendershot Paper Prod.
Home Oil Co.
Inland Natural Gas
Lorado Uranium Mines
Mid-West Indust. Gas
Mindustrial Corp.
North Canad an Oils
North Star Oil
Northspan Uranium
Ontario Jockey Club
PRM, Inc.
Ponder Oils
Pronto Uranium
Rio Tinto Mining
Stanleigh Uranium
Superior Propane
Traders Finance
Trans Canada Freezers
Union Acceptance
Ventures Ltd.
Webb & Knapp (Canada)
Western Decalta
Western Naco Petrol.
George Weston Ltd.
Willroy Mines

Forbes Magazine, the highly-respected financial periodical, said of THE SPECULATIVE MERITS OF COMMON STOCK WARRANTS, by Sidney Fried, that ". . . it throws a bright searchlight on a side of investment not known, or understood by the average investor," and went on to call the study ". . . the definitive work on this fascinating aspect of finance."

Common stock warrants have such rewards for those who understand them that many Wall Street professionals and average investors alike have praised THE SPECULATIVE MERITS OF COMMON STOCK WARRANTS by Sidney Fried, as vitally important to anyone interested in capital appreciation. Proving of real value to all who have given it careful reading, this study tells the entire story of the common stock warrant—what they are—why they are issued—when they may be profitably bought and sold—the dangers to watch for—the opportunities to seek. It has opened the door to a field of such potential that an investor ignores it only to his own detriment.



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In the list given here, and in the many additional warrants now coming on the scene, there will be many future opportunities. So far we have only *suggested* what is contained in the pages of the SPECULATIVE MERITS OF COMMON STOCK WARRANTS. It is our opinion that no investor interested in capital appreciation can ignore the potential of the common stock warrant, and many share our opinion that this book is the best possible first step towards taking advantage of this potential.

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RHM ASSOCIATES
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RHM

Attached is $2. Please send me "The Speculative Merits of Common Stock Warrants" by Sidney Fried, together with Supplement.

OG-1

NAME _____
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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Relationship Between Viscosity-Gravity Constant and Characterization Factor

What is the relationship between characterization factor and the viscosity-gravity constant? Each source seems to indicate a different relationship.—F.W.P.

This department is unable to survey the entire literature regarding viscosity-gravity constant. However, the approximate relationship for materials of the same average boiling point, as 800° or 900° F., is indicated in Table 1.

Perhaps the best relationship that is available is that of S. S. Kurtz, Jr., et al., "Relationship Between Crabon-Type Composition, Viscosity-Gravity Constant, and Refractory Intercept of Viscous Fractions of Petroleum," Anal. Chem. 28, 1928 (Dec. 1956). Their correlation is shown in Fig. 1. This indicates that viscosity is a necessary factor as well as boiling point and gravity, if the chemical structure of a material is to be adequately defined. The authors were able to relate such properties or factors as viscosity-gravity constant, characterization factor, and refractive index to the structure of the molecule, i.e., the number of carbon atoms in paraffinic chains, and the number associated in aromatic or naphthenic rings. Thus, if the values of two properties such as refractive index and viscosity-gravity constant are known, it is possible to approximate the molecular structure of the oil.

TABLE 1
Approximate Relationship Between the Characterization Factors and Viscosity-Gravity Constant for Materials of the Same Boiling Point

Characterization factor	Viscosity-gravity constant
10.0	1.088
10.1	1.072
10.2	1.056
10.3	0.041
10.4	0.026
10.5	0.012
10.6	0.998
10.7	0.985
10.8	0.972
10.9	0.959
11.0	0.947
11.1	0.935
11.2	0.924
11.3	0.913
11.4	0.902
11.5	0.892
11.6	0.882
11.7	0.872
11.8	0.862
11.9	0.852
12.0	0.842
12.1	0.833
12.2	0.824
12.3	0.815
12.4	0.806
12.5	0.798

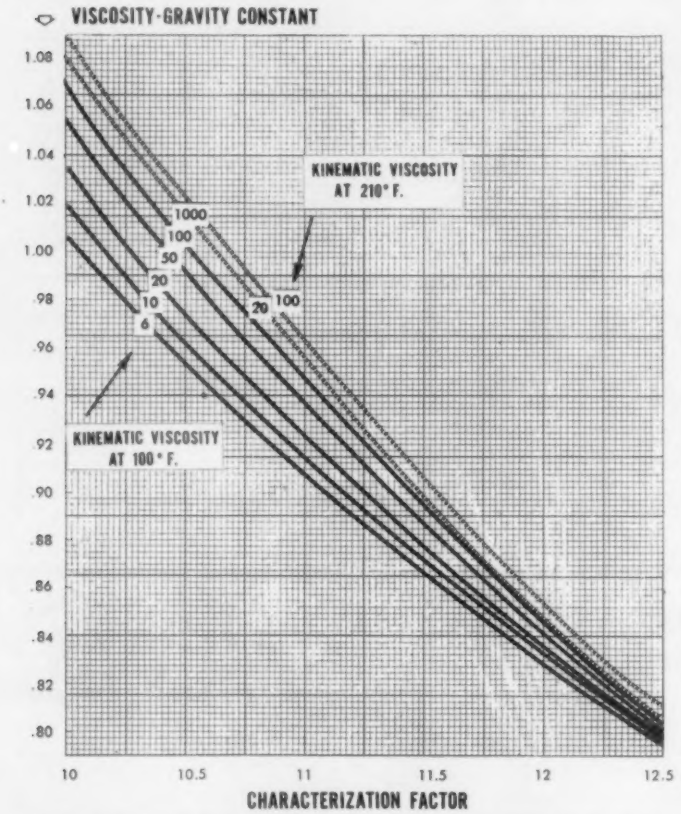


Fig. 1—Relationship of viscosity-gravity constant to characterization factor as a function of the viscosity of oils.

Cost of Forgings

In your Cost-imating series we see no mention of the cost of forgings. What can we use as an index for them?—P.S.T.

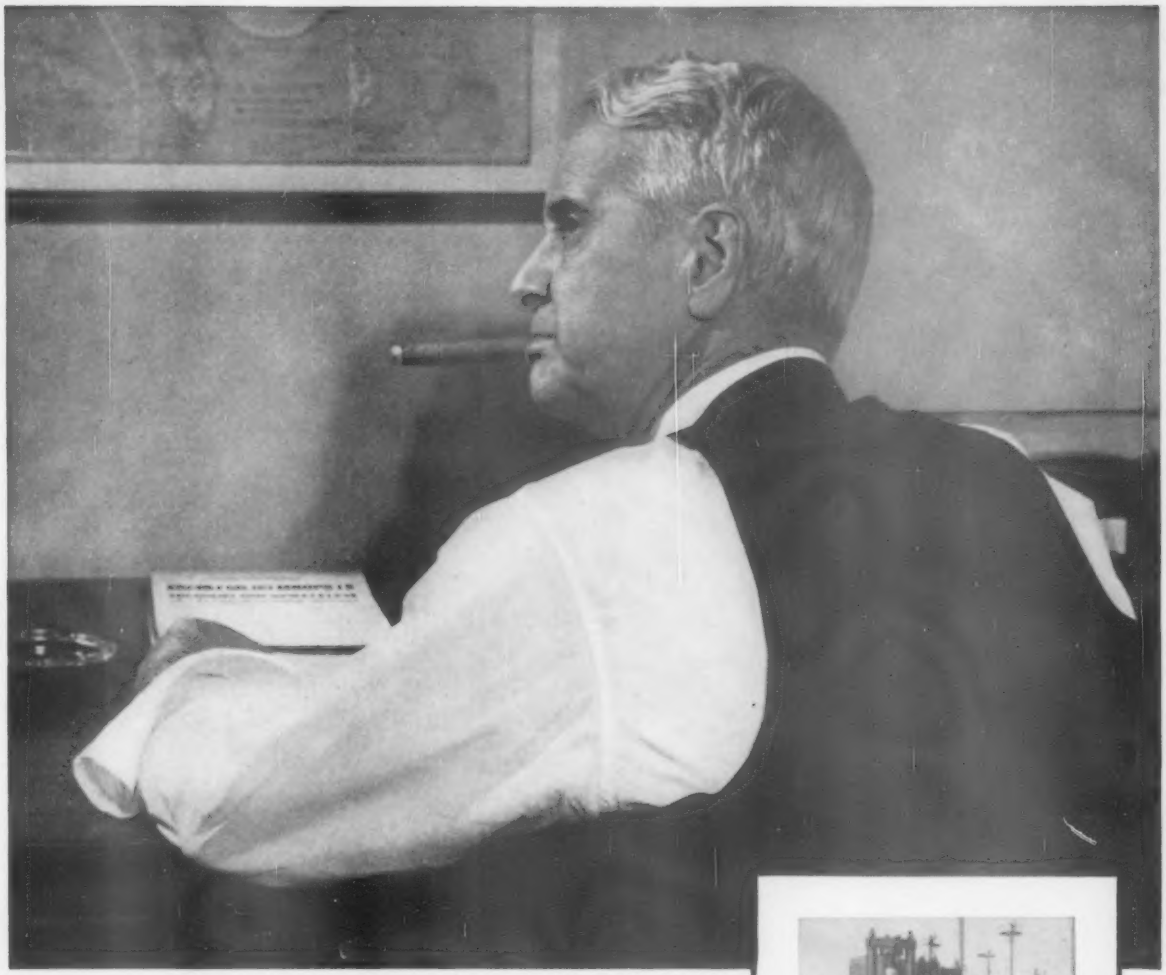
No entirely satisfactory source of the prices of forging is available. As an approximation, the author for some years has used the average of certain items of the Bureau of Labor Statistics which seem to partake of forged materials. These items are:

Code 10-42- 6—Axes
Code 10-42-16—Planes
Code 10-42-21—Chisels
Code 10-42-46—Vise
Code 10-42-61—Hammer

These items have changed in price since 1946 as follows:

	Approximate forging index
1946	100
1947	121
1948	130
1949	140
1950	151
1951	167
1952	179
1953	189
1954	196
1955 (estimate)	209
1956 January	221

Thus, forging apparently has increased in price much more rapidly than other materials.



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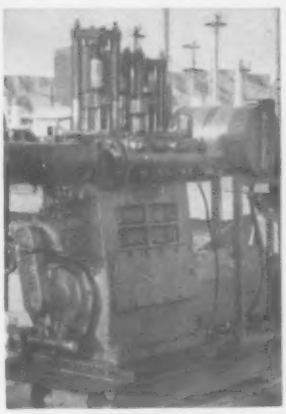
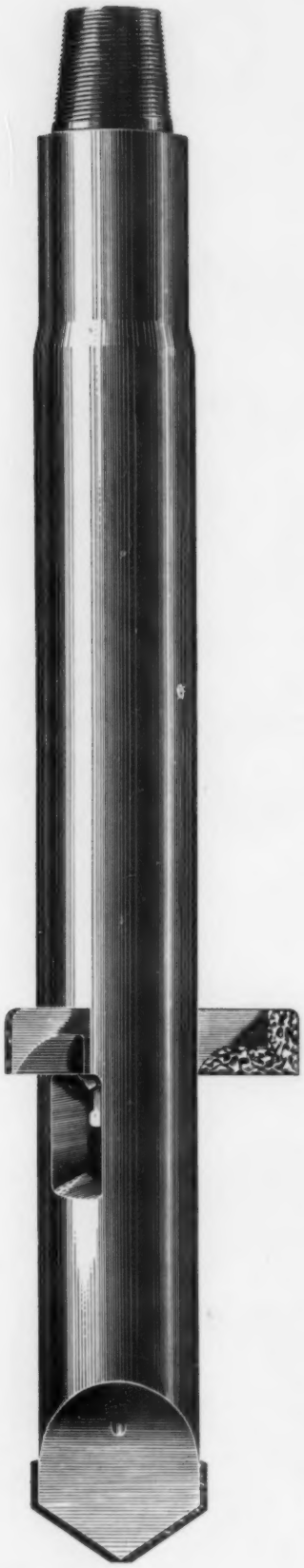


Shown above is one of a number of Aldrich 5" stroke, Triplex Pumps installed at a major west coast water injection project. These pumps are currently handling 35,000 bbl daily at injection pressures of 1,000 psi.

THE ALDRICH PUMP COMPANY



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For the full story, write for Bulletin No. 60

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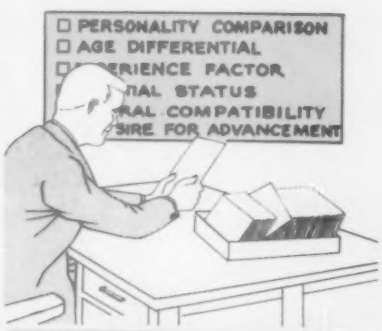
THE NEW WORKER

Show interest in new worker

Introduce him to fellow workers



Select proper man as instructor

A COMPANY'S **training program** gets it real workout, of course, with the new worker. Though a supervisor provides all sorts of training for all sorts of employes, his chief training activity is with the new man on the job. The new worker gets the most attention for several obvious reasons: if a new worker is to become adjusted and productive in a short time, he must be started in the right direction. Too many companies have a high turnover rate because they fail to recognize that simple but highly important fact. Turnover is usually caused by lack of information on the part of the new employe about the job—or is caused by lack of interest on the part of the company's supervisor in helping a new employe get off on the right foot.

Obviously the new employe must learn certain basic things about the work he is to do. No matter how bright the new employe may be, he can't be expected to tackle a new job "cold." No matter what his I.Q. or past experience may be—a certain amount of training "orientation" is necessary. He must learn what equipment and facilities are available and he also must understand what specific relationship his job has with the other jobs around him. He must understand the part he plays in the bigger picture of the company's operations. Naturally, a new employe will have questions, and a good supervisor should answer all questions as adequately as possible—and with a pleasant and favorable attitude while he's doing it. Likewise, a good supervisor should act as good-natured as possible—to get across the idea that **this** is a pleasant company, a pleasant working situation, and to encourage the new employe not to worry or be distracted, but to concentrate —with a certain peace of mind—on his new job.

Apparently 50 per cent of the training of a new worker is a kind of employe relations effort. Training the new worker to perform his new job is an obvious necessity. Less obvious perhaps, but certainly as important, is training the new worker in company good will and cooperative spirit. No progressive firm ever underestimates the need for making the new worker "welcome" on the job. Training the new employe in company policy of good employe relations means better training in other ways, too. A new employe—given a feeling of belonging—is at ease and receives all instruction more rapidly and completely.

If a supervisor does not take a new worker in hand, someone else may. A supervisor's job is to see that an employe is not misinformed by others and is not given negative attitudes about his company. Surveys give conclusive evidence that the causes of most turnover can be traced to events of the first few days that an employe is on the job. There are many reasons why potentially good employes quit a job in the first 30 days—but most of the reasons can be traced directly to supervisory failure. A supervisor must realize that a new worker represents an investment of a good-sized sum of money—money spent in selecting, hiring, and training procedures—and the new employe actually should be "handled with care," just for economy's sake if for no other.

When a new employe walks in the office door or onto the rig or into the refinery, he offers a challenge to the man who is to train him.

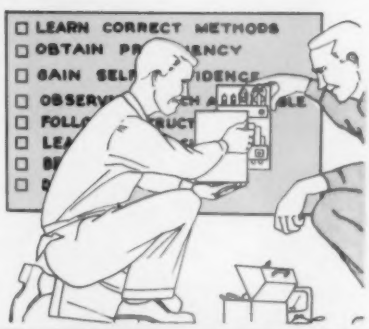
Perhaps the best procedure a supervisor can use is this: **Greet** the new employe cordially. Show a sincere interest in him. **Explain** the part he is to play in the company. **Take** him around. **Introduce** him to fellow employes. **Select** the right man to instruct him. **See** that he learns his job. **Then follow up. Don't forget him.**

TIPS ON T

METHODS OF INSTRUCTING

Explain each operation

Demonstrate each operation



Allow worker to do each operation

TRAINING of new employes gets down to its most essential level with on-the-job instruction—and the secret of effective on-the-job instruction is organization. If a supervisor takes time to plan job instruction before he starts, learning on the part of the employe is rapid and easy. If a supervisor starts giving instruction without any real plan, however, an employe can soon be lost in a forest of unrelated details and in a wilderness of omission.

There are, of course, a lot of different ways to go about instructing a worker. Underlying any instructional techniques, however, there are certain inevitable facts. Most people, for instance, just don't learn enough by **telling** alone. Some jobs are difficult to describe in words, and some work seems overly complicated when no more than a word description is given of it. Usually **telling** and **explaining** are not enough in themselves. A demonstration of the operation should be given.

Even here, however, a worker may not understand—especially if he doesn't know what to look for in the demonstration, or if he saw it done backwards, or if he had no chance to go through the motions himself. Remember—the goal of instruction is to have the worker learn the operation. Therefore, in addition to being **told** and **shown,** the worker must have a chance to **do** the operation, see the operation done in proper perspective, and receive a clear and careful explanation of the operation.

The best sort of on-the-job instruction takes place in three parts. The first part is the preparing the new employe psychologically for the instruction—making the employe anxious to learn by placing him at ease, arousing his interest in the job, and selling him on the job's importance. The second part is presenting the job itself—telling, explaining, illustrating, and demonstrating; encouraging the learner to ask questions; presenting the job clearly and slowly—one step at a time. This second phase of the instruction also includes the "trial run" for the new employe—letting the employe take over the job, under close supervision, so that his mistakes can be checked, his questions answered, and his understanding of the "why" as well as the "how" of the operation can be confirmed.

The third part of the instruction comes when an employe knows how to do the job and is put on his own. The point to remember here is that putting an employe on his own shouldn't mean leaving him out on a limb. He should be told where to go for more information, and the supervisor should check back with him frequently, pointing out whatever tricks of the trade are suitable to the job, and offering encouragement and praise.

Perhaps the most obsolete method of instruction that a supervisor could use is that of "osmosis." Osmosis is the lazy man's way out—and an expensive one, too. Counting on the new employe to "just soak up" from his fellow employes all he has to know is a first-class pedagogical fallacy. Letting the new employe "sink or swim" in his new job may separate the men from the boys—but again it may not. It may only frustrate a potentially valuable employe.

On-the-job instruction is not something that just happens. No matter what method is used, it has to employ such simple devices as stressing key points of operation, explaining new terms and new tools, breaking the job down into parts, and so forth. It means using every training aid available—magazine articles and reprints, sample jobs, pictures. **Experience is the best teacher** is an old saw that has a lot of truth in it—but experience alone teaches poorly if it is not channeled, directed, supervised, and bolstered with some organized instructional practices.

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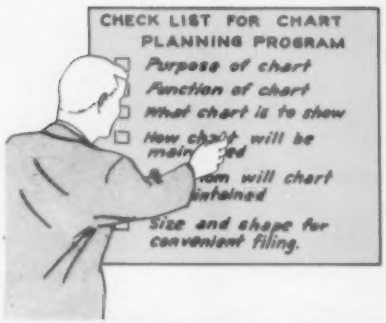
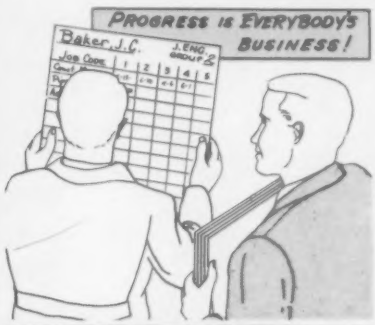
TRAINING—2

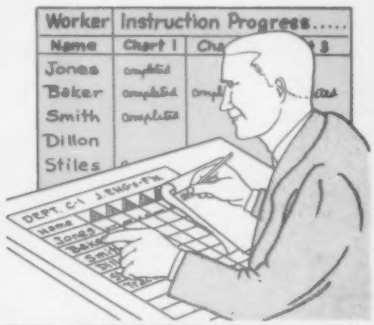
PROGRESS CHARTING


CHECK LIST FOR CHART PLANNING PROGRAM
Purpose of chart
Function of chart
What chart is to show
Size and shape for convenient filing.

Develop practical progress chart



Create worker interest in chart



Use charts as instruction guide

THE job of training can be made easier when the supervisor uses a training chart. A training chart gives the supervisor a simple method of recording and organizing training information, and permits him to find, readily, the gap between what has to be done and what his employes are now able to do.

The training—or progress—chart is quite simple to keep. For each employe in the company a record should be made of what job the worker performs, what skills the worker employs, how much training was required for the worker to develop these skills, and what additional skills the worker has that might be used in some other job.

By recording such information about each employe, a supervisor begins to accumulate important and usable data. By knowing how long it took one employe to master a certain skill, the supervisor can anticipate—in all likelihood—how long it will take another employe to do the same. By knowing what skills are needed to perform any particular job, the supervisor knows—from the data kept—which employe could be moved into that job if necessary.

Actually what a supervisor is doing in keeping a progress chart is keeping a running inventory of workers' skills. On the basis of this inventory, the supervisor is able to determine what additional training any employe should have, which employe should be trained first, which employe should be given a particular work assignment. In addition, a supervisor may find from his chart that five employes need the same sort of training and he can therefore institute some sort of group teaching with obvious savings in time and money.

Certain auxiliary information may be kept on this chart: is a particular worker capable of learning additional skills, is a particular worker likely to be transferred, promoted, or leave for any reason—thus necessitating the preparation of another employe for the job; is a particular employe handicapped in any way so that he should not perform a certain task even though otherwise he might meet the qualifications of that job?

Information for the training and progress chart should, of course, be taken periodically. By making the collection of training data a regular part of his job, the supervisor has always at hand up-to-date information to help determine what training to give to whom.

Not only the supervisor benefits from the training chart, however. By setting up the chart in such a way that the employe himself has a chance to see how much progress he is making in mastering the necessary work skills, a certain amount of "incentive" is introduced into the training program. An employe may even be encouraged to master, voluntarily, certain skills if he feels that some company record is being kept of his capabilities and that his skills are not being totally ignored. Also, it's a good psychological fact that recorded achievements help an employe's morale immensely.

Finally . . . The most important feature of progress charting, however, is that it gives concrete evidence to management, supervisors, and employes alike that effective training can take place. It serves as an accounting system for a highly important phase of company operations that could be ruined by a haphazard, incidental approach. The progress-in-training chart is a bookkeeping aid that ultimately contributes to company proficiency in general and, day-by-day, gives the supervisor the particular information he needs in carrying out his various training and instructional duties.

, giving your opinion and suggesting other subjects you would like. Address Editorial Department.
on request. Also check back for previous feature, February 25, 1957, issue, page 151.

New Forward Control Design provides more space because the engine is behind you. It puts a 74" pickup box on 81" wheelbase—record-breaking cargo space per inch of wheelbase. This efficient design makes maneuvering through rough terrain faster and safer.

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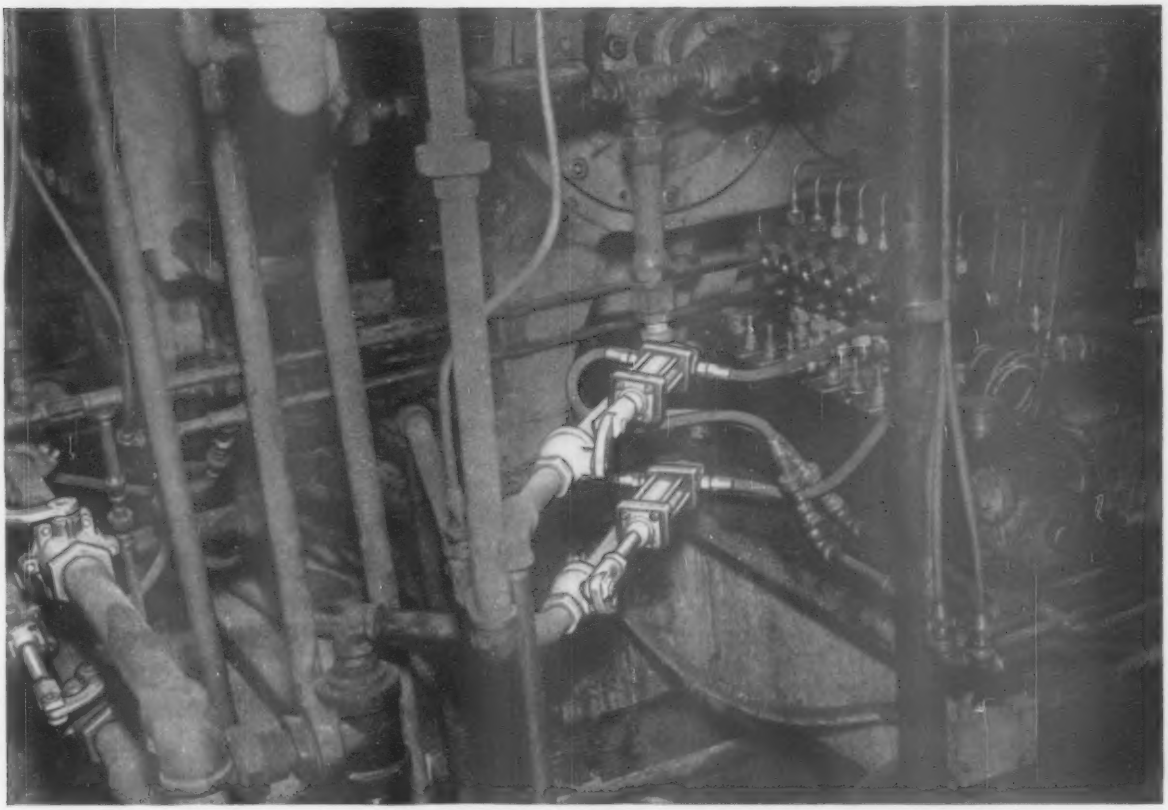

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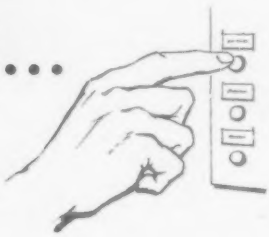
It's remote-controlled... It's ready for automation!



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YOU CAN DEPEND ON DOW

Pipeline Patrol

. . . Report on Construction

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

• **Cape Pipe Line Co.** (organized by Sun Oil Co., Cities Service Co., Atlantic Refining Co.)

Project: Long range plans for line on the lower Delaware Bay to the Philadelphia refining area.

Completion: 1960.

• **Four-Corners Pipe Line Co.** (newly formed by Shell Oil Co., Standard Oil Co. of California, Continental Pipe Line Co., Gulf Oil Corp., Richfield Oil Corp., Superior Oil Co.)

Project: 600 miles of line from near Farmington, N. Mex., in the Four Corners area to Los Angeles, to be constructed and operated by Shell Pipe Line Corp. as agent for the companies.

Status: Construction to start in April. Preliminary engineering work under way.

Fulton, R. H. & Co., Lubbock, Tex.

Project: 39 miles of 6-in. from Donkey Creek field in northeastern Wyoming, southeast to the Osage pump station in Weston County.

Status: Fulton, a contractor has applied to Wyoming Public Service Commission.

• **Interstate Oil Pipe Line Co.**

Project: 5 miles of 4-in. from South Bosco field, Louisiana, to present main line, and 5 miles of various size from Church Point field, Louisiana, to present main line.

Status: Proposed.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.

Status: To start May 1957.

Completion: August 1957.

• **Offshore Gathering Corp.,** Houston.

Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)

Status: Proposed.

Pasotex Pipe Line Co.

Project: 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: July 1. 1957.

• **Shamrock Oil & Gas Corp.**

Project: 35 miles of 6-in. to serve fields in Ochiltree and Hansford counties in the Texas Panhandle.

Status: Plans to start building in March or April 1957.

Shell Oil Co.

Project: Undetermined length of 3, 4-in. in South Louisiana.

Status: Under way.

Contractor: **Brown & Root, Inc.,** W. P. Stanley, spread superintendent, office at Buras, La.

Completion: September 30, 1957.

• **Sinclair Pipeline Co.**

Project: 150 miles of 20-in. from Teague, Tex., to Houston.

Status: Planned for 1958.

Completion: 1958.

• **Tecumseh Pipe Line System** (Joint venture of Sinclair Pipe Line, Ashland Oil & Refining, and Pure Oil Co.)

Project: 190 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.

Status: Under way.

Completion: September 1957.

• **Texas-New Mexico Pipe Line Co.** (owned by The Texas Co., Sinclair Pipe Line Co., Tidewater Oil Co., and Empire Gas & Fuel Co.)

Project: 515 miles of 16-in. from southeast corner of Utah to Jal in southeastern New Mexico.

Status: Field surveys began January 1957.

Union Oil Co. of California.

Project: 45 miles of 12-in. and 180 miles of 16-in. crude and products line from San Joaquin Valley to its Oleum refinery at Rodeo, Calif.

Status: Under way.

Contractor: **Roy Price, Inc.**

Completion: April 1, 1957.

Products Pipelines

• **Alaska-Yukon Refiners & Distributors, Ltd.**

Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canal line; another from Tok Junction, on the Canal line, to Anchorage.

Status: Proposed.

Completion: 1959.

• **American Pipe Line Co.**

Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.

Status: Proposed.

Buckeye Pipe Line Co.

Project: Conversion of 116 miles of 8-in. crude to products between Huntington, Ind., and Griffith, Ind.

Status: Planned.

Contractor: **Sheehan Pipe Line Construction Co.,** C. M. Brown, superintendent, office at Rochester, Ind.

Completion: Fall 1957.

Project: Conversion of 32 miles of 8-in. crude to products between Mantua, Ohio, and Youngstown area.

Status: Planned.

Contractor: Company will do own work.

Completion: November 1957.

• **Cities Service Pipe Line Co.**

Project: 29 miles of 6-in. ethylene line from Lake Charles, La., to Orange, Tex.

Status: Planned.

Completion: July 31, 1957.

• **Continental Pipe Line Co.**

Project: Conversion of 99 miles of 6-in. from the Wichita Falls area to near Fort Worth, Tex., plus a 15-mile extension of the line to the Grapevine area northeast of Fort Worth.

Status: Conversion under way. Extension planned.

• **El Paso Natural Gas Co.**

Project: 11 miles of 4-in. L.P.G. products from Snyder Line to South Andrews Plant, Texas.

Status: Planned.

Project: 240 miles of 6-in. from Odessa to El, Paso, Tex.

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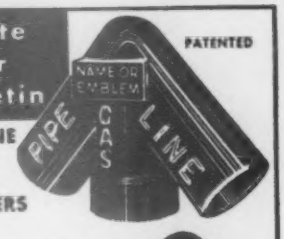

PIPELINE VENTS AND MARKERS

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LOUISIANA

S. E. HUEY & Co.

ENGINEERS & SURVEYORS

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MONROE, LA.

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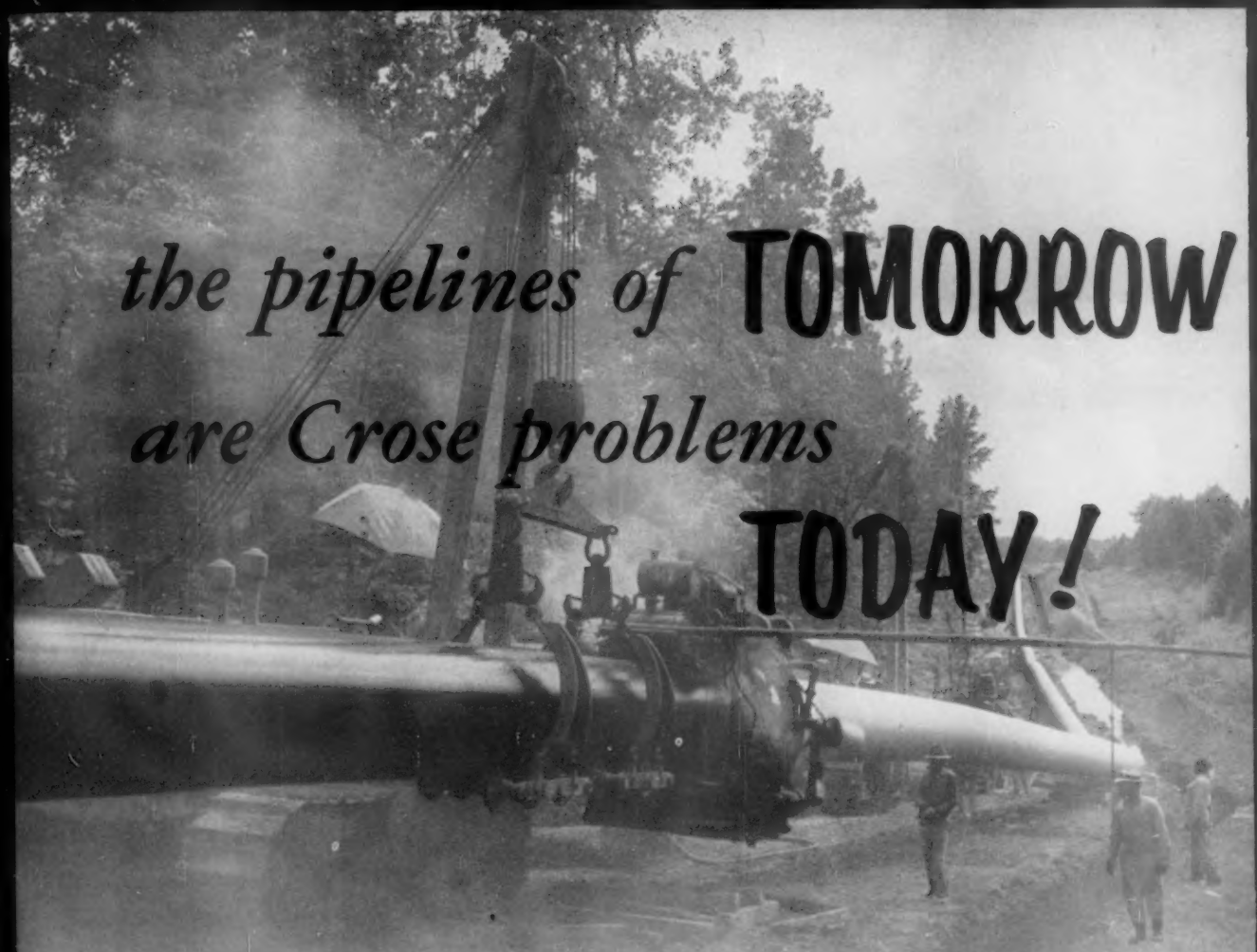
PIPE LINE SURVEYS



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Pipeline Patrol

Status: Planned.
Contractor: **Pipeline Engineering Co.** has design and engineering contract.
Completion: Early 1958.

Engineering Management, Inc.
Project: 58 miles of 10-in. from Richmond to Castle, Calif.
Status: Under way.
Contractor: **Hood Construction Co.,** William Burgess, spread superintendent, office at Sacramento.
Completion: July 1, 1957.

- **Great Lakes Pipe Line Co.**
Project: 84 miles of 8-in. from south of St. Paul to Eau Claire, Wis.; 68 miles of 12-in. from Great Lakes intersecting point with Badger Pipe Line to Chicago.
Status: Construction scheduled to start spring 1957.

- **Gulf Refining Co.**
Project: 530 miles of 10-in. L.P.G. and natural gasoline line from Waddell Plant in Crane County, Texas, to Mont Belvieu near Houston (368 miles is conversion from crude service).
Status: Under way.
Contractor: **Panama-Williams Corp.** has 46 miles from Waddell Plant to Midland. Remainder not let.

Gulf Refining Co.
Project: 90 miles of 6 to 8-in. from Eunice, N. M., plant to move raw products to West Texas-Gulf Coast line at Midland.
Status: Under way.
Contractor: **Eastern Pipeline Contractors,** Dallas.
Completion: April 1957.

- **Interstate Oil Pipe Line Co.**
Project: Four 38-mile lines from the Esso Standard Oil Co. refinery at Baton Rouge to Sorrento, La.: two 4-in. lines; one 6-in. line; one 8-in. line. Lines will carry ethylene, butane, and propane.
Status: Under way.
Contractor: **Fowler-Tatom Pipeline Contractor.**
Completion: April 1, 1957.

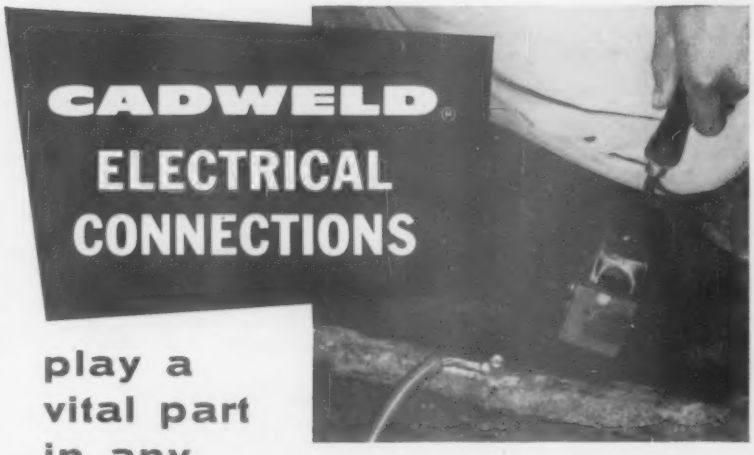
- **Laurel Pipeline Co.** (Gulf Refining Co. and Sinclair Pipe Line Co.)
Project: A 24-in. line from the Philadelphia refining area to Cleveland.
Status: Under consideration.

- **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)
Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: To start May 1957.
Completion: August 1957.

- **Ohio Oil Co.**
Project: 350-miles of 12-in. from Wood River, Ill., to Chicago.
Status: Work to start fall 1957.
Completion: 1958.

- **Southern Pacific Pipe Lines, Inc.**
Project: 100 miles of 10-in., 80 miles of 8-in., and 125 miles of 6-in. between Richmond, Calif., and Fallon, Nev.
Status: Under way.
Contractor: **River Construction Corp.** has 84 miles of 8, 10-in. from Richmond to Stockton, Calif. to complete late spring 1957, F. O. Traweek, spread superintendent, office at Richmond. **Hood Constructtion Co.,** Lynwood, Calif., has 58 miles of 10-in. from Stockton to Roseville, Calif. **Engineers, Limited Pipeline Co.** and **Joe E. Young Pipe Line Construction Co.** have 18 miles of 6 and 8-in. between Roseville and Donner Summit.
Completion: August 1, 1957.

- **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.
Status: Proposed.



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Pipeline Patrol

Natural-Gas Pipelines

• **Arkansas Louisiana Gas Co.**
Project: A 300-mile line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system, plus gathering lines.
Status: Long-range plans.

Carolina Pipeline Co.
Project: 177 miles of 2, 3, 4, 6, 8, and 10-in. between Blacksburg and Camden. S. C.
Status: Work to start June 1, 1957.
Contractor: **Panama-Williams Corp.**

• **Central Hudson Gas & Electric Corp.**
Project: 46 miles of 10-in. from Albany to Kingston, N. Y.
Status: Planned.
Completion: November 1, 1957.

Cities Service Gas Co.
Project: 8 miles of 16-in., 20 miles of 8-in., 20 miles of 6-in., and 20 miles of 4-in. field lines in Barber County, Kansas.
Status: Approved. Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 3 miles of 12-in., 8 miles of 10-in., 4 miles of 8-in., 8 miles of 6-in., and 37 miles of 4-in. field lines in Eureka Field, Okla.
Status: Approved. Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 4 miles of 16-in. at Sarcoxie, Mo.
Status: Approved. Under way.
Contractor: **Prairie Construction Co.**
Project. 64 miles of 6 to 30-in. in Leavenworth and Anderson counties, Kansas, Cass County, Missouri. and Oklahoma County, Oklahoma.
Status: Planned.

• **Coastal Transmission Corp.**
Project: 575 miles of 12, 20, 22, 24-in. main line and 414 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: Has FPC approval.
Completion: January 1, 1958.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.
Status: Pending FPC approval.
Project: 139 miles of 4 to 24-in. from Mocane to Hooker, Okla.
Status: Planned.
Contractor: **Panama, Inc.** Spread offices will be at Beaver City and at Mocane, Okla.
Completion: May 15, 1957.

• **El Paso Natural Gas Co.**
Project: 338 miles of 34-in. from San Juan and Permian basins to California border.
Status: Under way.
Contractor: **R. H. Fulton Co.** has 102 miles; **Western Pipeline, Inc.,** has 144 miles; El Paso will construct remaining 92 miles.
Completion: April 1957.
Project: 74 miles of 34-in. San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: August 1957.
Project: 81 miles of 18-in. from Panoma Plant, Gray County, to Dumas Plant, Moore County, Texas.
Status: Planned. Filed for FPC permit.
Completion: July 1957.
Project: 177 miles of 20-in. from Sonora Plant, Sutton County, to Plains Plant, Yoakum County, Texas.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 74 miles of 30-in. Permian-San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 216 miles of 6 to 34-in. in Arizona, Texas, and New Mexico, plus 533 miles of various size line.
Status: Filed for FPC permit.

Fish Service & Management
Project: 300 miles of 2 to 10-in. distribution lines at Boise, Idaho.
Status: Under way.
Contractor: **Hood Construction Co.,** C. R. Shearman, spread superintendent, office at Boise.
Completion: April 30, 1957.

Houston Texas Gas & Oil Corp.
Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 240 miles of 18-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sales laterals in Florida. Main line to join Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.
Status: Planned. FPC certificated.
Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.
Completion: June 1958.

• **Iron Ranges Natural Gas Co.,** St. Paul.
Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.
Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co.**
Project: 61 miles of various size gathering line in Camerick field, Texas County, Oklahoma.
Status: Approved.

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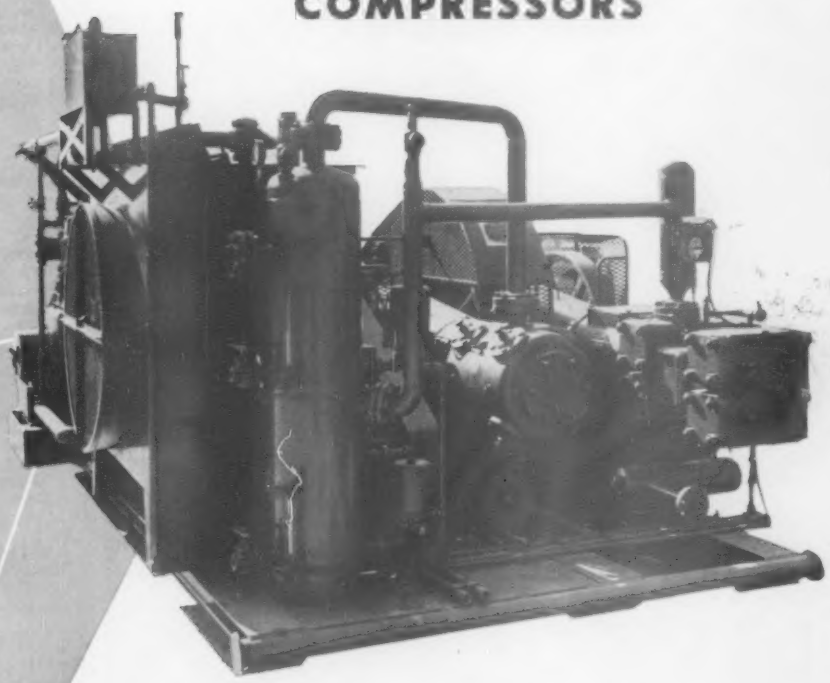

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Compressor Division, P. O. Drawer 19

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Pipeline Patrol

Project: 10 miles of 10-in. between Grand Island and Fullerton, Nebr.
Status: Approved.
Completion: May 1, 1957.
Project: 12 miles of 12-in. between Scott City and Colby, Kans.
Status: Approved.
Completion: May 1, 1957.

Michigan Consolidated Gas Co.
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.;** Floyd Huduall, spread superintendent, office at Cadillac, Mich.
Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.,** jointly with **J. L. Gentry Construction;** Frank Morris, spread superintendent, office at Hart, Mich.

- **Michigan Wisconsin Pipe Line Co.**
Project: 24 miles of 24-in. and 16 miles of 4-in. looping in Michigan, Indiana, Illinois, Wisconsin, Iowa, and Missouri.
Status: Approved.
Completion: 1957.

- **Midwestern Gas Transmission Co.**
Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.
Status: Application pending with FPC.

- **Mississippi River Fuel Corp.**
Project: 125 miles of loops along portions of present lines from fields in Louisiana and eastern Texas, to St. Louis.
Status: Planned.

- **Mountain Fuel Supply Co.,** Salt Lake City.
Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.
Status: Has temporary FPC permit.

- **Natural Gas Pipeline Co. of America**
Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex.
Status: Has FPC approval.
Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.
Status: Application pending with FPC.

- **North Carolina Natural Gas Corp.** (Subsidary of Colonial Natural Gas Corp.)
Project: 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.
Status: Has FPC permit.

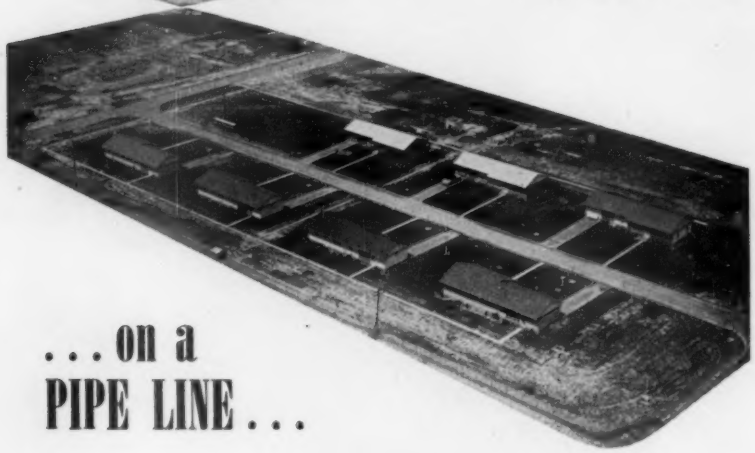
- **Northern Natural Gas Co.**
Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.
Status: Under way.
Contractor: **Troth Construction Co.**
Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.
Status: Planned.

- **Offshore Gathering Corp.,** Houston.
Project: 364 miles in Gulf of Mexico off Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)
Status: Application pending with FPC.

- **Ohio Fuel Gas Co.**
Project: 7 miles of 12-in. near Fremont, Ohio.
Status: Planned.
Completion: First half 1957.
Project: 23 miles of 18, 20-in. from Gibsonburg to Toledo.
Status: Uncertain.
Project: 152 miles of line in Ohio: 38 miles of 24-in. from Crawford Station to Utica; 18 miles of 24-in. from Pavonia Station to Line D; 6 miles of 20-in. from Mount Gilead to Claridon; 4 miles of 20-in. near Dayton; 4 miles of 20-in. near South Charleston; 7 miles of 16-in. near Springfield; 6 miles of 20-in. nnear Oberlin; 17 miles of 20-in. from Oak Hill to Symmes Station; 7 miles of 12-in. from Mount Sterling to Bloomingburg; 2 miles of 8-in. near Bellefontaine; 3 miles of 12-in. near Mansfield; 4 miles of 12-in. near Lakeville; 7 miles of 8-in. in Guernsey and Belmont counties.
Status: Planned.
Completion: Second half 1957.

- **Pacific Gas & Electric Co.**
Project: 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Project: 138 miles of 34-in. looping of the Topock-Milpitas line.
Status: Under way.
Contractor: A joint-venture firm, **Midwestern-Johnson-Dixon,** has completed 65 miles.
Completion: 73 miles to be completed in 1957.
Project: 200 miles of 12-in. from Sacramento Valley gas fields to Humboldt County, California.
Status: Under way.
Contractor: **Hood Construction Co.** has 28 miles between Hinkley and Victorville, Calif.,

LUXURY LIVING . . .



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Pipeline Patrol

Joe Oviatt, spread superintendent, office at Hodge.

Completion: Project to be completed December 1, 1957. Hood Construction work to be completed April 1, 1957.

Completion: December 1, 1957.

- **Pacific Northwest Pipeline Corp.**

Project: 37 miles of 6-in. from Dove Creek to Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.

Status: Has FPC permit.

Project: 1,000 miles of gathering lines and laterals along present line.

Status: Planned.

Completion: 1957.

- **People Natural Gas Co.**

Project: 58 miles of 2 to 14-in. extension and replacement lines in Pennsylvania.

Status: Work to start April 1957.

Completion: September 1957.

- **Permian Basin Pipeline Co.**

Project: 83 miles of 16-in. from its Spraberry station in Midland County, Texas, to tie in with Pioneer Gathering System, Inc., at a point in northwestern Schleicher County, Texas.

Status: Filed for FPC approval.

- **Phillips Petroleum Co.**

Project: 6 miles of 16-in. in Gray County, Texas.

Status: Under way.

Contractor: **Arey Construction Co.**

Completion: May 1, 1957.

Project: 3 miles of 24-in. in Moore County, Texas.

Status: Planned.

Completion: October 1, 1957.

Project: 30 miles of 3 to 8-in. in Moore, Hutchinson, Sherman, Hansford, and Gray counties, Texas, and in Texas County, Oklahoma.

Status: Planned.

Contractor: Various.

Completion: January 1, 1958.

- **Piedmont Gas Co.,** Hickory, N. C. (Parent is Carolina Natural Gas Corp.)

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Status: Application pending with FPC.

- **Pioneer Gathering System, Inc.**

Project: 27 miles of 16-in. and 27 miles of 12-in. in Schleicher and Sutton counties, Texas.

Status: Filed for FPC approval. Estimate to start work March 1, 1957.

Completion: July or August 1957.

Southern California Gas Co. and Southern Counties Gas Co. of California.

Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: June 30, 1957.

- **Southern Natural Gas Co.**

Project: 5 miles of 8-in. laterals in Napoleonville Field, La.

Status: Pending FPC approval.

Completion: December 1, 1957.

Project: 5 miles of 8-in. between Fort Jackson and Olga, La.; 32 miles of 6-in. from Chandeleur Sound area, Breton Island, La.; 7 miles of 8-in. and 5 miles of 10-in. from Main Pass area to Olga, La.; 9 miles of 8-in. from Bastian Bay Field to Fort Jackson Field; 7 miles of 8-in. laterals in Manila Village Field.

Status: Plan to apply for FPC permit.

Completion: December 1, 1957.

Spokane Natural Gas Co.

Project: 400 miles of 1 through 24-in. distribution system at Spokane.

Status: Under way.

Contractor: **Hallmac Construction Co.;** V. L. Williams, spread superintendent, office at Spokane.

Completion: 1957.

- **Tennessee Gas Transmission Co.**

Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.

Status: Pending FPC approval.

Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.

Status: Pending FPC approval.

Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.

Status: Pending FPC approval.

Project: 76 miles of 24-in. between Coudersport, Pa., and Hamburg, N. Y.

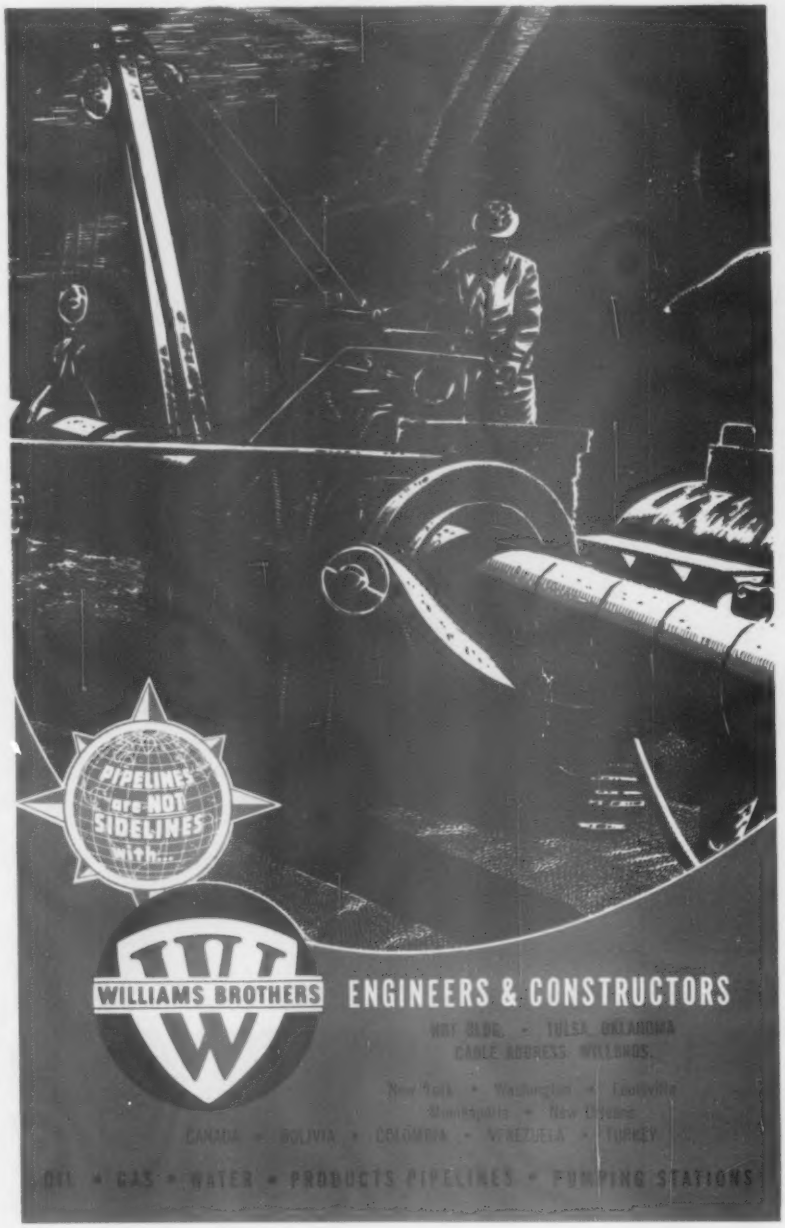
Status: Pending FPC approval.

- **Texas Eastern Transmission Co.**

Project: 422 miles of 30-in. from near McAllen to Beaumont, Tex., to move imported Mexican gas; 45 miles of 24-in. laterals from McAllen to Provident City, Tex., 77 miles of 30-in. looping between Kosciusko, Miss., and Uniontown, Pa.; 147 miles of supply and sales laterals.

Status: Under way.

Contractor: **Houston Contracting Co.** has 121 miles of 30-in. between Angleton and Vidor, Tex., to start March 1, 1957. **H. C.**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Pipeline Patrol

Price Co. has 70 miles of 30-in. **H. B. Zachry Co.** has 201 miles of 30-in. starting near McAllen and running northeast to near Angleton, Tex. **Grayco Constructors, Inc.** has 45 miles of 24-in. laterals from Blessing to Provident City. **Western Pipe Line, Inc.,** Austin, has 30-in. crossings at Nueces, Lavaca, and Carancahua bays. **Missouri Valley Dredging Co.,** Omaha, has crossings at Hinds and Guadalupe bays. **Altgelt Construction Co., Inc.,** has 100 miles of 3, 4, 6, 8-in. gathering lines in the Corpus Christi area.

Completion: Fall 1957.

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.

Status: Has FPC approval.

- **Texas Illinois Natural Gas Pipeline Co.**

Project: 10 miles of 36-in. to loop existing single 30-in. near Joliet, Ill.

Status: Pending FPC approval.

- **Transcontinental Gas Pipe Line Corp.**

Project: 131 miles of 36-in. and 52 miles of 30-in., part of main line from Texas to New Jersey.

Status: Pending FPC authorization.

Completion: December 1957.

Project: 42 miles of 36-in. and 16 miles of 30-in., part of main line from Texas to New Jersey.

Status: Proposed. Pending FPC permit.

Completion: December 1957.

Project: 162 miles of 24-in. and 64 miles of smaller diameter laterals along main line from Texas to New Jersey.

Status: Proposed. Pending FPC permit.

Completion: December 1957.

- **United Gas Pipe Line Co.**

Project: 40 miles of 8-in. from Baldwin County, Alabama, to Container Corp.'s plant.

Status: Applied to FPC.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.

Project: 140 miles of 20-in. from Safaniya field in the Persian Gulf to Ras Tanura, Saudi Arabia, plus an 8-in. gathering system in the gulf.

Status: Under way.

Contractor: **International Bechtel Brothers, Inc.**

Completion: April 1, 1957.

Bolivian Gulf Oil Corp.

Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.

Status: Awaiting pipe.

Contractor: **Williams Brothers Co.**

Completion: December 1957.

- **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

Cia. Shell de Venezuela

Project: 23 miles of 20-in., 5 miles of 16-in., 2 miles of 24-in. from Lake Maracaibo wells to Cabimas, Venezuela.

Status: Under way.

Contractor: **Brown & Root, Inc.**

Completion: April 1957.

- **Colombian Petroleum Co.**

Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.

Status: Planned.

- **Creole Petroleum Corp.**

Project: 87 miles of 30-in. from Temblador field to Caripito in Venezuela.

Status: Planned.

Completion: 1959.

Project: 9 miles of 26-in. from Ule to La Salina in Venezuela.

Status: Planned.

Completion: Late 1957.

Interprovincial Pipe Line Co.

Project: 156 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.

Status: To start May 1957.

Contractor: **Somerville Construction Co.** has 90 miles; **Majestic Contractors, Ltd.,** has 66 miles.

Completion: September 1, 1957.

Project: 33 miles of 24-in. from Kendal to Peebles, Sask.

Status: To start June 1, 1957.

Contractor: **Fulton-Banister, Ltd.**

Completion: July 31, 1957.

Project: 79 miles of 26-in. from Clearbrook, Minn., to Superior, Wis.

Status: To start June 1, 1957.

Contractor: **R. H. Fulton & Co.**

Completion: August 31, 1957.

- **Iraq Petroleum Co.**

Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq and Turkey to the Turkish port of Iskenderun on the Mediterranean sea.

Status: Proposed. Survey completed.

Israeli Government

Project: 125 miles of 8-in. from Elath to Beersheba.

Status: Under way.

Completion: March or April 1957.

- **Mene Grande Oil Co.**

Project: 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion lateral, Venezuela.

Completion: First quarter 1957.

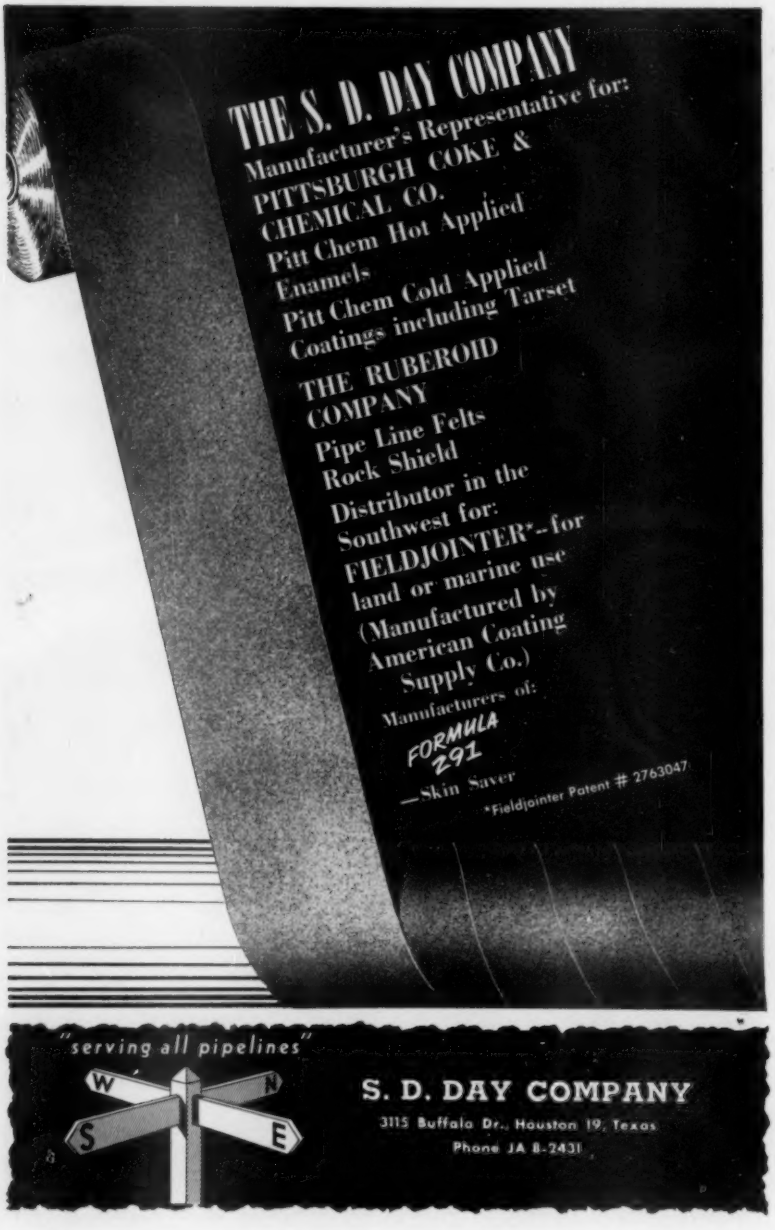
Project: 59 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.

Status: To start in 1957.

Completion: First quarter 1958.

- **North-West Oil Pipelines Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)

Project: 210-mile line from the refining



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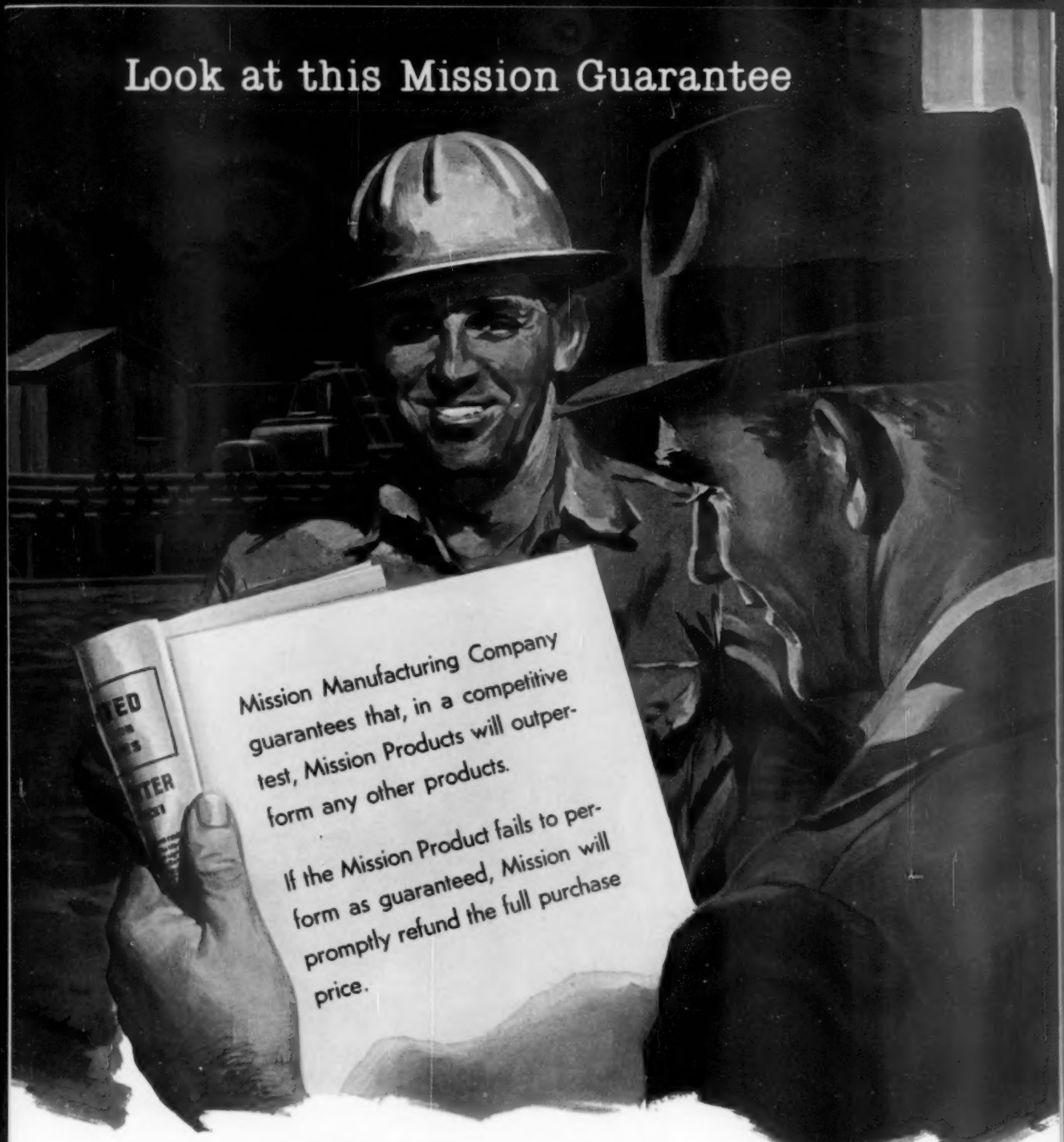
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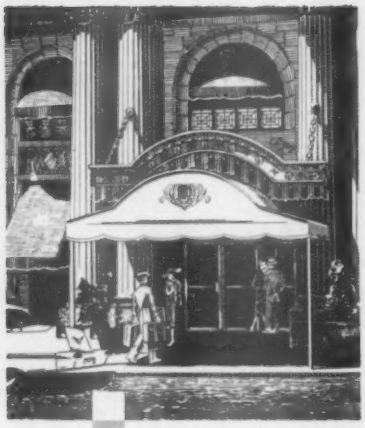

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Pipeline Patrol

centers in the industrial Ruhr area of West Germany to Wilhelmshaven.

Status: Planned.

Completion: 1959.

Pembina Pipe Line, Ltd.

Project: 100 miles of 3 to 12-in. gathering line in Pembina oil field.

Contractor: **Universal Pipe Line, Ltd.**, subsidiary of Mannix, Ltd., T. Childress, spread superintendent, office at Drayton Valley, Alta.

Completion: November 1, 1957.

Project: 32 miles of 16-in. from Calmar to Edmonton, Alta.

Status: Work starts April 15, 1957.

Contractor: **Universal Pipe Lines, Ltd.**, subsidiary of Mannix, Ltd., Otis Hare, spread superintendent, office at Calgary, Alta.

Completion: July 1, 1957.

Rangeland Pipe Line Co.

Project: 48 miles of 12-in. between Sundre and the Sylvan Lake in south-central Alberta.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.**

Completion: August 1957.

● **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.

Status: Company is considering project together with several other companies.

Sinclair Oil Corp. and Socony Mobil Oil Co. Co.

Project: 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

Status: Under way.

Contractor: **Williams Brothers Sudamericano, Ltd.**

Completion: July 1957.

● **Royalite Oil Co., Ltd.**

Project: 250 miles of line to move oil from the Athabasca oil sands of northeastern Alberta to Edmonton.

Status: Long range plans.

Completion: 1960.

● **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**

Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.

Status: Under study.

● **Trans Mountain Oil Pipe Line Co.**

Project: 100 miles of 30-in. loops: 50 miles east of Kamloops, B. C., and 50 miles west of Edson, Alta.

Status: Engineering completed by Canadian Bechtel, Ltd.

Contractor: **Marine Pipeline & Dredging, Ltd.**, has Thompson River crossing, B. C., J. H. McCartney, spread superintendent, office at Kamloops, B. C.

Completion: 1957. River crossing will be completed June 15, 1957.

Union of Soviet Socialist Republic

Project: 2,300-mile Trans-Siberian crude and products line from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Status: Under way.

● **Westspur Pipe Line Co.**

Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.

Status: Planned. Has requested permit from Board of Transport Commissioners.

Project: 75 miles of 16-in. from Steelman, Sask., to Cramer, Man., Canada.

Status: Work starts May 1957.

Completion: July 30, 1957.

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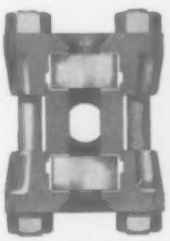

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Yacimientos Petroliferos Fiscales (Argentina)
Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Under way.
Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.
Project: 497 miles from Mendoza to Buenos Aires.
Status: Proposed.

Foreign Products Pipelines

Hydrocarbons Pipeline Co. (Subsidiary of Canadian Hydrocarbons)
Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.
Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957.
Construction consultants: **Dutton-Williams Brothers, Ltd.**, Calgary, and **A. D. Little & Co.**, Boston.

Imperial Oil, Ltd.
Project: 37 miles of 12-in. from Waterdown to North Toronto, Ont.
Status: Under way.
Contractor: **Majestic Contractors, Ltd.**, Otis Hare, spread superintendent, office at Cooksville, Ont.

Israeli Government
Project: A 6-in. line from the Haifa refinery to Tel Aviv.
Completion: Late 1957.

National Iranian Oil Co.
Project: 573 miles of 10-in. from Ahwaz to Teheran, Iran.
Contractor: **Enterpose of Paris**, has northern 236 miles. Southern section completed.

• **North Atlantic Treaty Organization (NATO)**
Project: 2,000 miles of lines to airfields in parts of Europe.
Status: Under way.
Contractors: **Associated Pipeline Contractors, Inc.**, has 450 miles from Iskenderun, Turkey, to Batman. **TECHINT** (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956 on 300 miles of 12-in. between Marseille and Langres, France. Taking bids on 275 miles in northwestern France: 54 miles of 2-in. from Langres to Mirecourt, 63 miles of 2-in. from Mirecourt to Phalsbourg, 47 miles of 8-in. from Mirecourt to Metz, 30 miles of 8-in. from Phalsbourg to Deux Ponts, 35 miles of 8-in. from Phalsbourg to Strasbourg.

United States Defense Department
Project: Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain.
Contractors: Prime contractor — **Brown-Raymond-Walsh; Merritt Chapman & Scott, Benson & Montin** of Oklahoma City, **Agroman Construcion Co.** of Spain.

Foreign Natural-Gas Pipelines

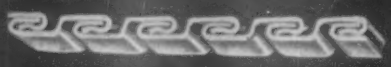
• **Alberta Gas Trunk Line Co., Ltd.**
Project: 637 miles of 34 to 16-in. gathering lines in Alberta.
Contractor: **Dutton-Williams Brothers, Ltd.**, has preliminary studies, design and management-engineering. **Universal Pipe Line, Ltd.**, subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.**, has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress.
Status: River crossing to be completed April 1, 1957. Total project to be completed in 1960.

Andes Pipeline Corp. (Subsidiary of Glenn McCarthy, Inc.)
Project: 500 miles of 12-in. from Mc-

(Continued on page 242)

EXTRA HEAVY DUTY

HEAVY DUTY

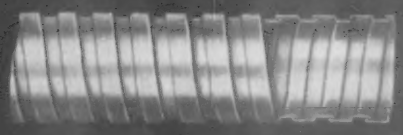


LIGHT DUTY

MEDIUM DUTY

PENFLEX

LIGHTWEIGHT EXHAUST



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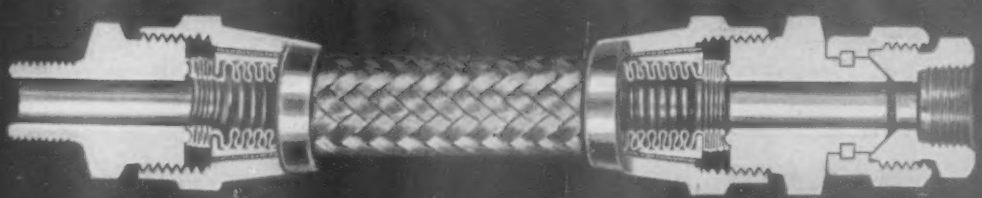
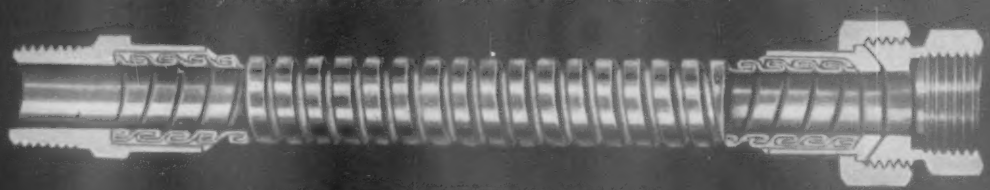
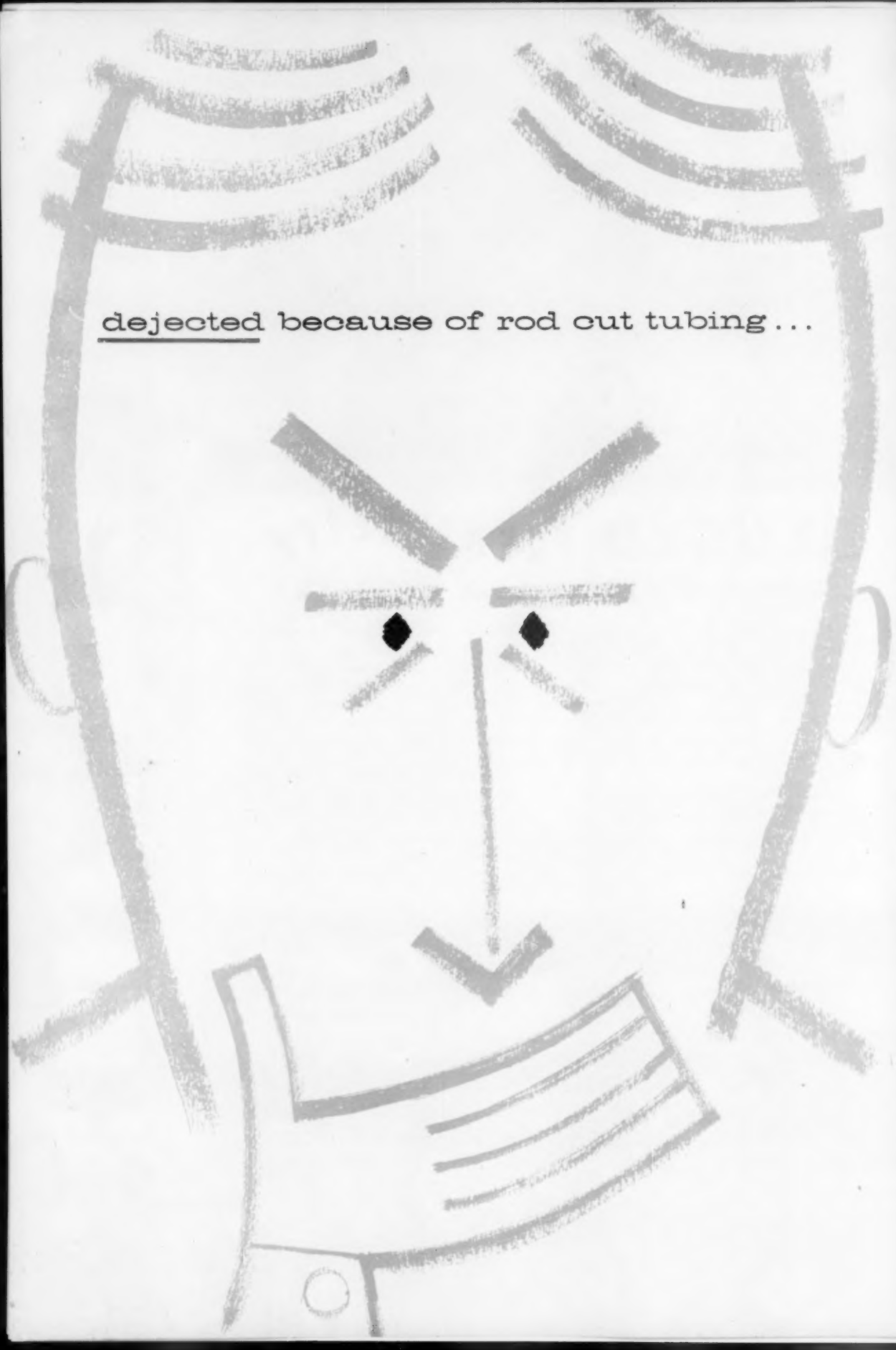


PENFLEXWELD WITH HEATPROOF COUPLINGS



M-100 WITH SOLDERED COUPLINGS

dejected because of rod cut tubing...



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OILMASTER Sucker Rod Guides are used as a means of centering the sucker rod string in the tubing—eliminating wear on the rods and couplings—minimizing and distributing the wear on the tubing.

They are designed with the fluid passage in the form of a helix, with the bearing areas overlapping to give the effect of a continuous smooth bearing surface against the tubing. The annular clearance plus the area of the passages provides a liberal area for fluid to flow past the guide.

The wear surfaces of the OILMASTER Sucker Rod Guides are faced with a thick coating of Colmonoy—a torch-applied hard facing material that possesses an exceptionally low coefficient of friction against the relatively soft steel of the tubing. The fact that it is possible to obtain both a low coefficient of friction and a high wear value is explained by the micro-structure of the Colmonoy material. It is composed of hard crystals of Boron and Chromium in a nickel matrix. Under microscopic examination, these crystals assume an exceptionally smooth overlapping pattern—presenting a surface which will slide readily over a mating surface with no tendency to seize and a minimum of frictional drag.

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OILMASTER Rod Guide in new joint. Note large contact area which reduces and distributes wear.

Illustration shows application of OILMASTER Sucker Rod Guide with ¾" sucker rods in 2½" tubing as it replaces a coupling in the sucker rod string.

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Among the
Drilling Contractors

Harry L. Edwards Drilling Co., Houston, is starting a deep test for Austral Oil Exploration Co. in St. John the Baptist Parish, southeastern Louisiana. Location is in Lake Des Allemands, on State Lease 2688. It is about 8 miles northwest of the large Paradis field, nearest production, and about 25 miles west of New Orleans. A 12,000-ft. test is planned.

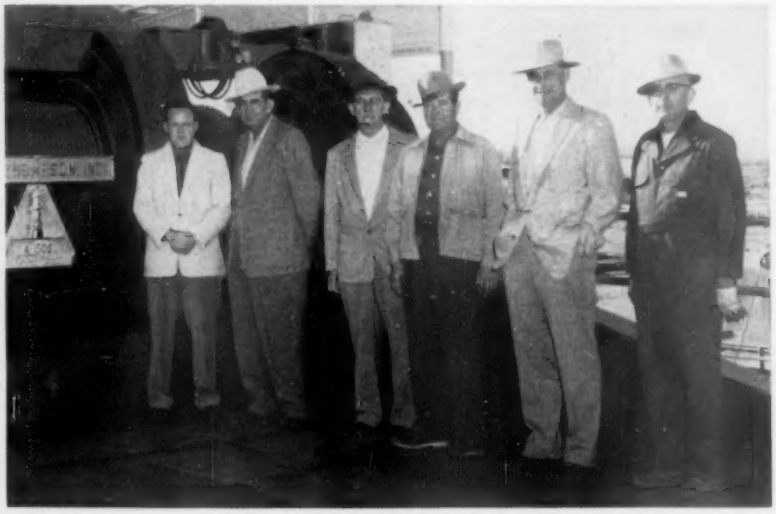
B. F. Allison Drilling Co., Fort Morgan, Colo., has a rig working for **Miracle-Fifer Drilling Co.** and J. Glenn Johnston, of Denver, at a wildcat location 14 miles northeast of Denver, in Adams County, Colorado. The test, 1 State-Anderson, is scheduled to go through the Skull Creek formation, about 8,400 ft., but may be carried deeper. Location is 4½ miles northeast of Second Creek field, in 16-2s-65w.

H. L. Rowley, Inc., Shreveport, has taken contracts for three more Wilcox wells in Patton Church field, in Catahoula Parish, eastern Louisiana. One is for W. Paul Edman, of Houston, at 1 Renfrow, in 24-8n-6e. It has a 5,600-ft. permit. The other two are for Gulf Oil Corp., one at 1 Hardie, in 13-8n-6e, on the northeast flank, a 5,100-ft. contract, and the other at 1 Mophett, ¼ mile east in 18-8n-7e.

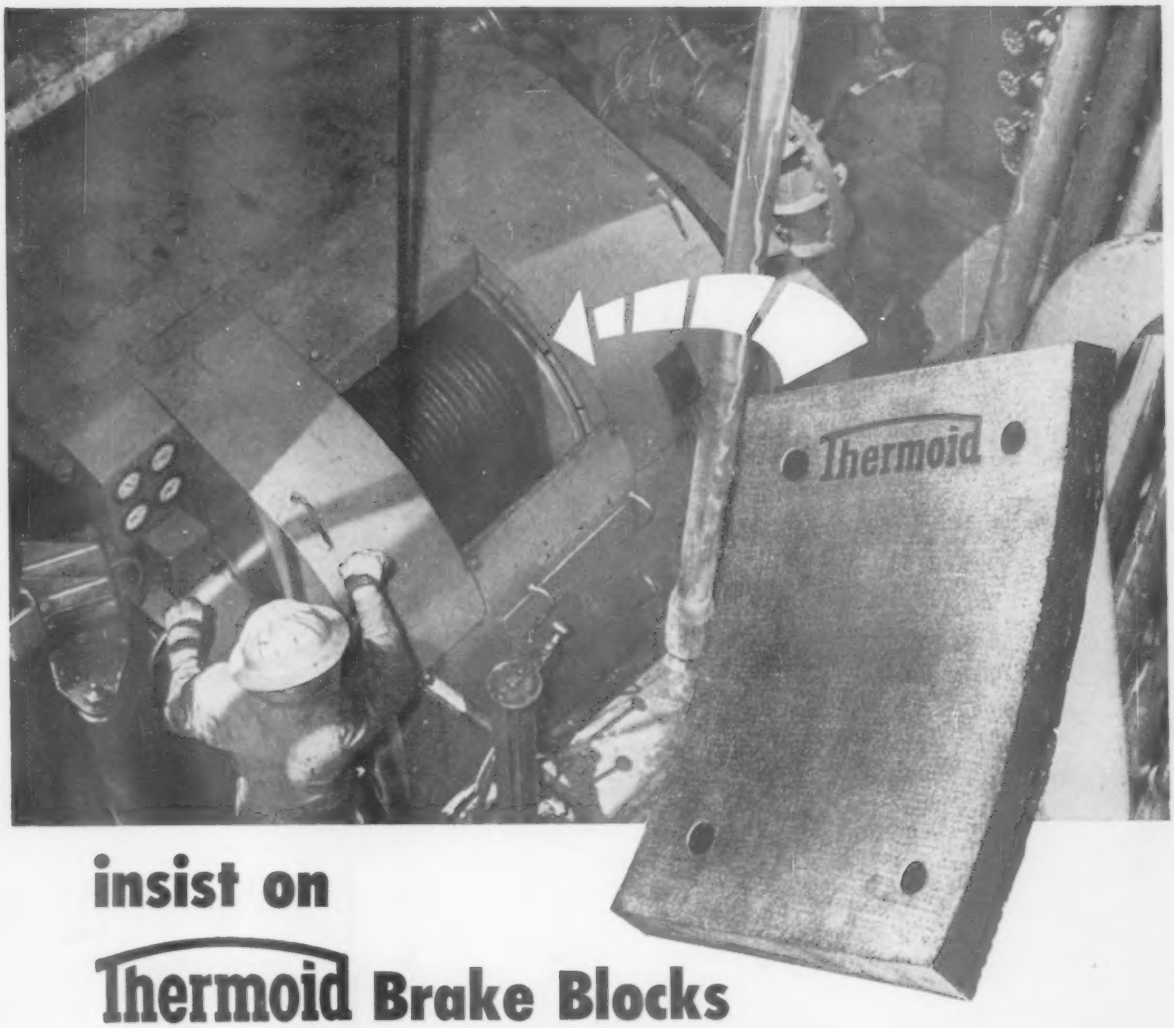
Cook Drilling Co., Fort Worth, has a new 11,000-ft. operation under way in Bull Creek field, Union Parish, North Louisiana. It is a contract job for Southwest Gas Producing Co., Inc., of Monroe, La., and will attempt to confirm Smackover gas and condensate production discovered last October by Carter Oil Co. Location is at 1 Jones, in 29-21n-3w, about 3 miles southwest of Bernice.

Allen & Morris, San Antonio, got the contract for the deep test Standard Oil Co. of Texas is to put down in northwestern Live Oak County, in the central coast area of Texas. Location is for 1 Isaacks, in the Lewis Ayers Survey, 2 miles northeast of Calliham (in McMullen County). Plans call for a 14,000-ft. test.

Montgomery Drilling Co., El Dorado, Ark., and **Bagley Drilling Co.,** Shreveport, have new operations under way in Baskinton area, of Franklin Parish, northeastern Louisiana. Montgomery is drilling for Murphy Corp. and Sun Oil Co. at 12-D Holt, a 4,300-ft. test, 1½ miles southwest of Baskinton field. It is ½ mile north of town in 5-15n-8e. Bagley is working for Custer Primos and others, of Monroe, La., at 1 McKeithen & Brown,



ON THE FLOOR of the newly assembled 1,900-hp. Emsco rig A. W. Thompson, Inc., Houston, is placing in operation in the West Texas-Southeast New Mexico area. Left to right: Marvin Crudup, Emsco Manufacturing Co.; K. L. Beck, and Harry Woodward, general superintendent and drilling superintendent, respectively, for Thompson; Jack Gray, Emsco; Paul Shaffer, Thompson's chief engineer; and T. A. (Andy) Price, tool pusher on the rig. The rig, rated capable of drilling to depths below 20,000 ft., is one of the largest in the area.



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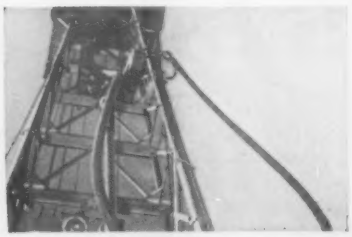

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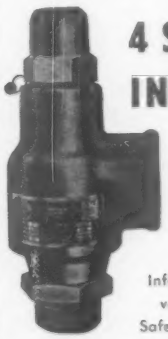

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Inferno makes a variety of 2" Safety Pop Valves:

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Write for Bulletin No. 32

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INFERNO

in 18-15n-8e, 2 miles southwest of Baskinton, and about 2 miles west of Turkey Creek field. It is a 4,200-ft. contract.

Offshore Co., Baton Rouge, La., will drill Shell Oil Co.'s new wildcat test located 50 miles off the coast of Cameron Parish, Louisiana, in the Gulf of Mexico. Location is on Shell and Gulf Oil Corp.'s OCS Lease 0409, in Block 252, West Cameron area. It is about 2 miles from a 12,200-ft. dry hole drilled a year ago by Gulf in the adjoining block on the west.

Nowery Drilling Co., Shreveport, is on a new contract job at a wildcat location southeast of Greenwood-Waskom field, in Caddo Parish, northwestern Louisiana. It is set up as a 6,500-ft. Travis Peak test. Location, at 1 Knouse, in 29-17n-15w, is about 1½ miles from production, nearest being the deeper Cotton Valley development.

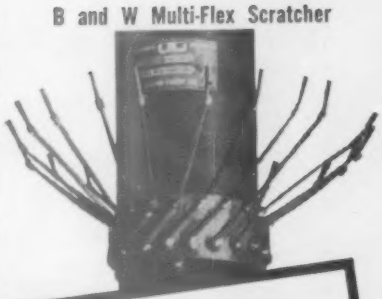
O'Brien Drilling Co., Shreveport, is on a new contract job 2 miles north of Kingston, in DeSoto Parish, northwestern Louisiana. It is a 6,700-ft. Travis Peak test for J. K. Wadley, of Texarkana, Ark. Location, at 1 Scott, in 9-14n-13w, is about a mile south of Rambin Bayou, and 2½ miles southwest of Frierson.

Brewster-Bartle Drilling Co., Houston, is scheduled for another deep well Gulf Oil Corp. will drill at Darrow, in Ascension Parish, southeastern Louisiana. The new job is a south offset to Gulf's newly completed gas discovery well a mile north of previous production. It is at 1 Falcon, in 22-10s-2e, and is set up as a 10,700-ft. contract. The extension discovery well tested 30,000,000 cu. ft. of gas per day through ¾-in. choke from a 10,550-ft. Oligocene sand.

J. D. Sprecher Drilling Co., Casper, Wyo., has a rig working for Shell Oil Co. at a remote wildcat location in southwestern Corson County, northwestern South Dakota. Location is in 12-18n-19e, in the Meadow Creek area. The test is listed as 22-12 Evridge et al.

Carl Short, Inc., Dallas, has the contract for another well Pure Oil Co. has announced for Gueydan field, in Vermilion Parish, coastal Louisiana Short's new job is at 3 Southwest Louisiana Land Co., on the southwest side of the field. It is spotted in 4-12s-1w, and is scheduled as an 11,500-ft. test. **Mac Drilling Co.,** Houston, also has a rig working for Pure at Gueydan. Its current job is at 19 Alliance, in 33-11s-1w, now drilling near 14,000 ft.

B and W Multi-Flex Scratcher



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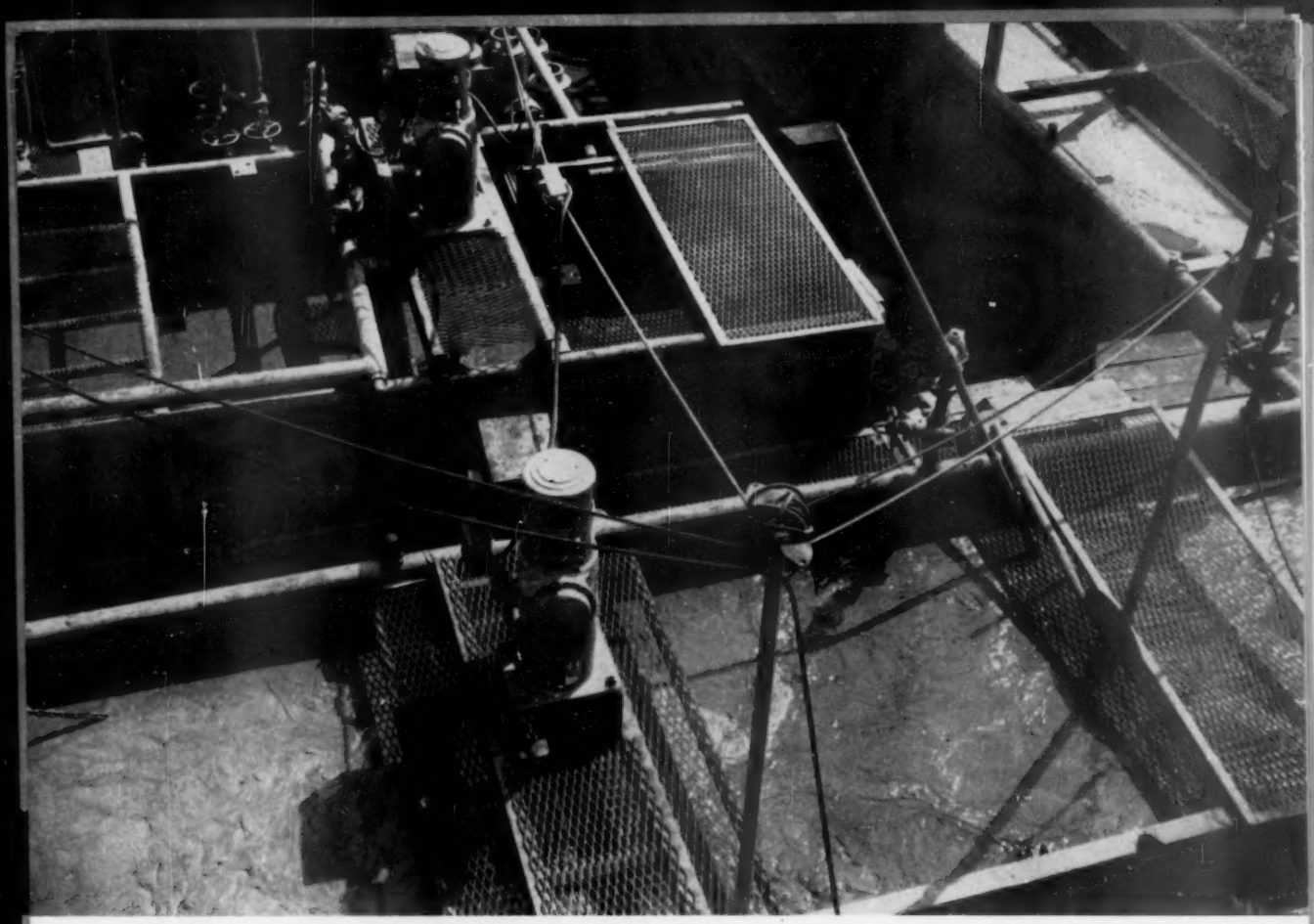

"...cuts the work of mixing mud *90 per cent*"

"SWEETEST THINGS I EVER SAW," says Mr. W. R. Morphis about the LIGHTNIN Mud Mixers installed on Shoreline Drilling Company's Rig No. 3. This rig is drilling for the Southern Natural Gas Company.

That statement comes from Tool Pusher W. R. Morphis. He's talking about the LIGHTNIN Mixers on Shoreline Drilling Company's Rig No. 3—located in the Plumb Bob Field, St. Martin Parish, Louisiana. One look at the mud flow in Shoreline's tanks (above) will tell you what's behind his statement.

You get uniform mud and *immediate* dispersion of gel additions with LIGHTNINS. In fact, you get the type of mud mixing that prompted Mr. Morphis to say:

" . . . sweetest things I ever saw. Cuts the work of mixing mud 90 per cent. No auxiliary mud pump necessary. Just keeps the mud all evenly mixed with practically no attention."

Ask the men who've used LIGHTNIN Mixers. They'll tell you there's no better way to get mud in condition and keep it there. With a LIGHTNIN Flash Mixer, you can increase the weight of every gallon of mud in the tank—by the exact amount you want *—in a few seconds.* Heavier, thicker mud is yours the moment you want it!

Seeing is believing

Your LIGHTNIN sales engineer will arrange a visit to a rig in your area where LIGHTNINS are at work. Look him up in the Composite Catalog. Tell him you want to see for yourself how LIGHTNINS can give you better mud control *for less money.*

To learn more about LIGHTNIN mud control, write us for free Bulletin B-502.

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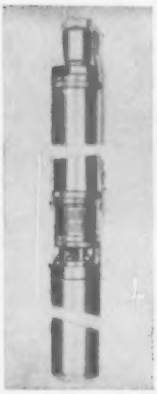
SHOWCASE...

NEW EQUIPMENT

Five-Hp. Oil-Well Pump Delivers 800 Barrels Per Day



This new 5-hp. Reda oil-well pump will pump from depths as great as 1,500 ft. Too, it will provide capacities above 800 bbl. per day, the maker states.

Available in two models for different ranges in well depth, the pump will fit in well casings as small as 4½ in. **Write or call: Reda Pump Co., 504 West First, Bartlesville, Okla., for more information on 5-hp. oil-well pump.**

●

Buttress-Thread Casing Offers Advantages

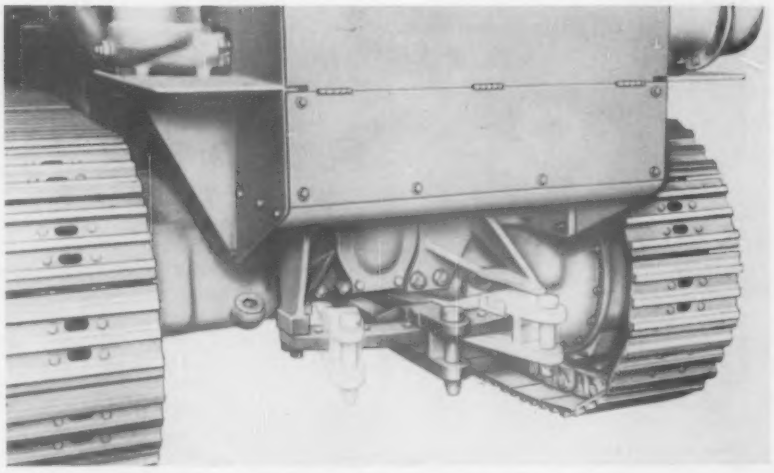
This new buttress-thread casing was developed for use in drilling deep wells. The buttress thread is used to provide a casing joint which will safely and economically support the weight of the casing required for deep wells.

The buttress-thread casing will be available in oil-field seamless casing in sizes of 5½ to 9⅝-in. o.d., in grades of J-55, N-80, and P-110.

Buttress-thread casing has many advantages over A.P.I. threaded-and-coupled casing, according to the maker. The five threads per inch and the form of the threads are conducive to easy stabbing and rapid spinning.

The high tensile strength of the buttress thread is due largely to the combined effect of the completely engaged runout threads and the 3° flank angle of the thread. The coupling threads engage the casing threads throughout their length. And hoop stresses induced by tension are nearly eliminated because of the small thread-flank angle.

The buttress thread, which is applied to nonupset casing, develops practically the full strength of the body of the pipe. **Write or call: Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa., for details on buttress-thread casing.**



Swinging Drawbar Has Five Positions

An optional attachment now available for the Caterpillar 933 Traxcavator is this swinging drawbar.

The five-position drawbar can be used to tow various types of trailing equipment. It gives the No. 933 drawbar versatility comparable to that of the Caterpillar D2 tractor, the maker states. The center of the drawbar clevis is 14¾ in. off the ground, and the drawbar has a swing arc of 16¾ in. **Write or call: Caterpillar Tractor Co., Peoria, Ill., for details on No. 933 drawbar.**

●

Automatic Separator Cleans Air for Compressing

This improved Wilkerson Series 1070 float-operated automatic separator is designed to furnish clean air for drilling compressors, air clutches, and air-line systems in refineries and to oper-

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in THE OIL AND GAS JOURNAL - Issue of March 18, 1957

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KRAFTBILT

OIL INDUSTRY FILING EQUIPMENT

ELECTRIC LOG FILE E-27

NEW, deep-drawer filing cabinet for reduced, electric well logs 6½" or less in width.

This 7-drawer unit is the newest addition to the quality KRAFTBILT line of log cabinets. Deeper drawers accommodate easily the wider, reduced logs. Each drawer will hold 600 reduced well logs. Total file capacity is 4,200 of the wide, reduced logs. Size and construction exactly like Model E-28.

Model E-28 Electric Log Cabinet

Model G-34, G-36 Strip Log Cabinet

Filing Supplies to fit perfectly are available for all KRAFTBILT units.

Write for Catalog 656-B on Kraftbilt

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SHOWCASE . . .

New Equipment

ate in any type of air system where an accumulation of water and oil exists.

Since the separator's actuation depends on a float in the accumulated moisture and sludge, flow of air may be continuous or interrupted or at low or high pressure (up to 250 psi.). Made in standard line sizes from ¼ to 3 in., the separator can be obtained on special order for larger sizes to clean most any volume of air and to automatically eject any amount of water, oil, and contaminants.

Employing a highly absorbent element, the filter can be easily replaced without removing the complete unit from the line. The separator may prove particularly desirable to prevent moisture from freezing in the air lines when drills are operated in freezing temperature. **Write or call: Wilkerson Corp., 1636 West Girard Avenue, Englewood, Colo., for details on Series 1070 separator.**

●

Pump Adapter May Stop Gas Lock, Stripping Jobs

When used with any insert or liner-barrel oil-well pump, this Stone pump adapter is designed to eliminate stripping jobs, wet string jobs, or gas locking, according to the maker. The pump adapter is basically a stationary pump plunger that can be fitted to a traveling valve and tube for any standard liner barrel or insert pump.

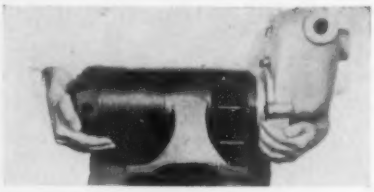
Only a traveling-valve assembly and tube need be added to the adapter to complete an operating pump. The plunger may be fitted with rings, cups, and repack, or other packing.

With the adapter installed, when a pump cannot be removed by a reasonable pull on the rods, letting the rods down for slack and turning them to the right turns a left-hand thread between a no-go ring and the top of the seating assembly. This action disengages the pump from the seating assembly.

When the rods are then lifted, fluid rushes from the tubing through the seating assembly, washing off sand and relieving fluid weight in the tubing on the seal between the seating assembly and seating nipple or tubing. After the fluid equalizes in the tubing and casing, the rods may be screwed back in by turning to the left. The whole pumping assembly can then be removed as an ordinary rod job.

All critical parts of the pump adapter are manufactured of brass to avoid a "gyp" seal to the adjacent steel tubing. **Write or call: S-Y Mfg. Co., Young Bldg., 2 North Main, Sapulpa, Okla., for details on Stone pump adapter.**

●



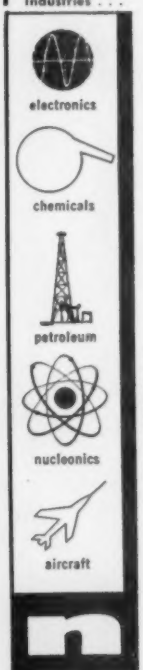
Centrifugal Pump Is Light, Resists Corrosion

Here's a new self-priming, self-lubricating centrifugal pump that is light weight and resists corrosion. It's available in ratings of ½, ¾, and 1 hp., with either 1 or 1½-in. suction and discharge openings.

The pump features an extra-heavy shaft and pyramid mount. Its dual dis-

RADIOACTIVE

Serving These Industries . . .



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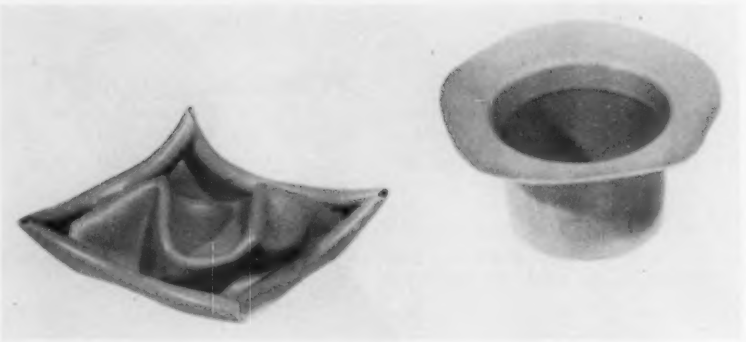
New Equipment

charge openings permit flexibility in piping.

The use of a solid-aluminum casing, head and impeller makes the pump light. The pump's rising head-capacity curve makes it suitable for miscellaneous filter applications.

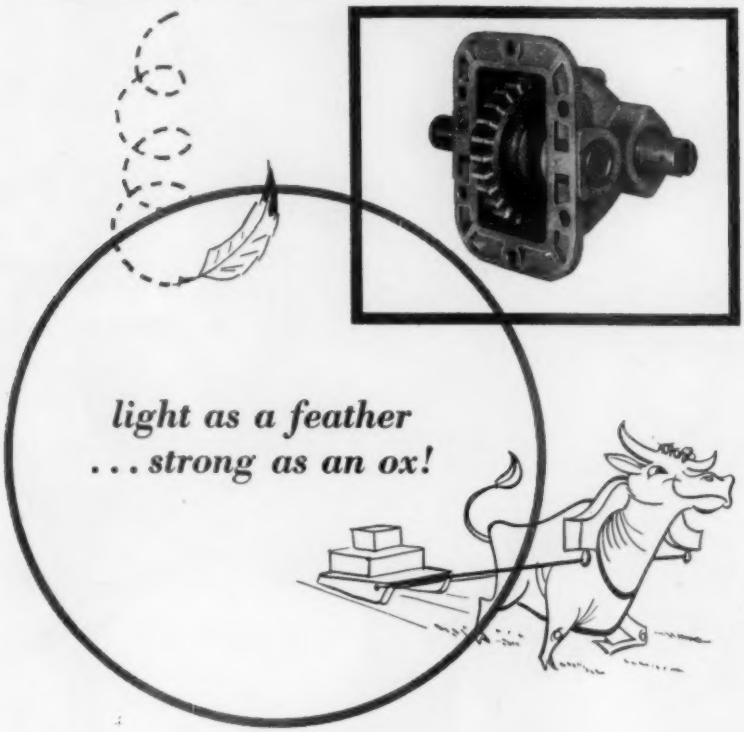
Both motor and engine-driven units will be available in pipe sizes to 6 in. **Write or call: Worthington Corp., Harrison, N. J., for details on self-priming centrifugal pump.**



Diaphragm Seal Usable For Extreme Temperatures

Where JP-4 and similar types of fluids are handled at extreme temperature ranges, this diaphragm seal may prove useful. Impregnated with a fluoro-silicone rubber, the new seal is usable at temperatures ranging from —80° to 400° F., the maker states.

Called the Bellofram F diaphragm, it is expected to find many applications in fuel hydraulic metering, measuring, and controlling. And it can be obtained custom-made to individual applications. **Write or call: Bellofram Corp., Burlington, Mass., for details on Type F diaphragm seal.**



THE *NEW TULSA*® POWER TAKE-OFF

SINGLE SPEED • MEDIUM DUTY

Extremely light . . . you can hold it in the palm of your hand . . . because the NEW TULSA Power Take-Off has a die-cast aluminum housing which at the same time gives all the ruggedness and durability for which the TULSA line is famous around the world. Output shaft available in three sizes—13/16″, 7/8″ and 15/16″—and rotates on two needle bearings. Furnished with either cable or lever control to suit individual operators' requirements. Designed and built for the full range of medium duty work, this new power take-off offers the extra advantage of low price, nationwide distribution and service that have made the TULSA line a favorite everywhere.

Tulsa Winch
TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

Steam Valve Features Built-In Strainers

Two valuable features have been incorporated in this new pressure-reducing and regulating valve for steam service—built-in pilot and main-valve strainers.

Known as the Cash Standard Type 44, the valve is a single-seat, internal

New Equipment

pilot-operated, piston-actuated model. It is highly sensitive and responsive to the smallest changes in reduced pressure, the maker claims.

The strainers reduce maintenance to a minimum over long periods of service. And they are easily removable for cleaning or replacement, without removing the valve from the line.

The valve's maximum inlet pressure is 250 psi. at 400° F. Its delivery pressures range from 5 to 250 psi. The valve is also available with an external sensing line. Available valve sizes range from 2 to 4 in. The valve has an iron body and flanged ends. **Write or call: A. W. Cash Co., P. O. Box 551, Decatur, Ill., for Bulletin 981.**

•

Heating Unit Assists Well-Tester

Here's a special heating-unit accessory for cold-weather use on the maker's well tester. First worked in the Rocky Mountain areas, it is now available as optional equipment.

The heating unit has two purposes: (1) to keep the water, separated from the oil, in the well tester from freezing; (2) to separate emulsified water from oil. The latter is accomplished by warming the oil until it allows the water to coalesce.

The unit is a three-phase separator with positive-displacement oil and water meters and a bellows type of gas meter. It is equipped with a production time recorder which marks each barrel of oil discharged on a chart. **Write or call: Oil Metering & Processing Equipment Corp., 4843 Yale, Houston 18, Tex., for details on well-tester heating unit.**

•

Portable Relay Unit Cuts Down Time

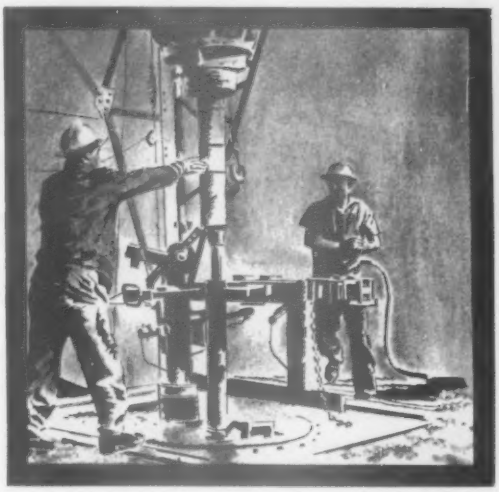
Here's a new portable relay test unit made in two types, for testing and maintaining switch-gear components. The unit is useful for testing relays, meters, coils, and circuit breakers.

Two or more of the Type RA1-1 portable test units may be used in combination for complete testing of switch-gear components. And the Type RD1-1 portable test unit may be used for simple testing of meters, protective relays, overload heaters, and tripping coils.

With the Nelson test unit, all components of switch-gear equipment can be properly tested and set with one piece of equipment. According to the maker, the new equipment will save considerable down-time when testing switch-gear components.

And each basic unit is light enough to be loaded and unloaded from the trunk of an automobile by one man. **Write or call: Nelson Electric Mfg. Co., P. O. Box 5385, Tulsa, Okla., for Bulletin 774.**

TWO MILES DOWN—



that's where performance really pays off—and where MD Barite Engineering Service pays its biggest dividends. Whatever the depth, the recommendation of your MD Field Service Engineer can help you log more hole at less cost. He's an expert on drilling problems and drilling mud. His recommendations can mean real savings in casing, prevention of caving and longer tool life. What's more, he can provide you with barite of consistently high quality any time of the day or night from strategically located distribution points.

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Field party on survey for proposed Canyon Dam on Texas' Guadalupe River.

W&T SURVEYING ALTIMETERS SPEED HYDROLOGIC STUDY OF RESERVOIR BASIN

TYPE FA-176

A ground-water and geologic survey, involving water table isograms for 400 square miles adjoining the proposed Canyon Dam Reservoir on Texas' Guadalupe River, recently was completed in 35 days. Despite difficult terrain and maximum relief of 1000 feet, over three hundred spot elevations were taken during this period. The speed with which this work was done is attributed to the use of the two-base method of altimetry employing three Wallace & Tiernan Type FA-176 Surveying Altimeters.

Technical data on the FA-176 Altimeter include: **Range** — any interval of 2000' up to max. limit of 5000'; **Accuracy** — 2.0'; **Sensitivity** — 0.5'; **Scale Length** — 20"; **Dial Size** — 8½" dia.

For details on FA-176, send for Bulletin No. TP-7-A

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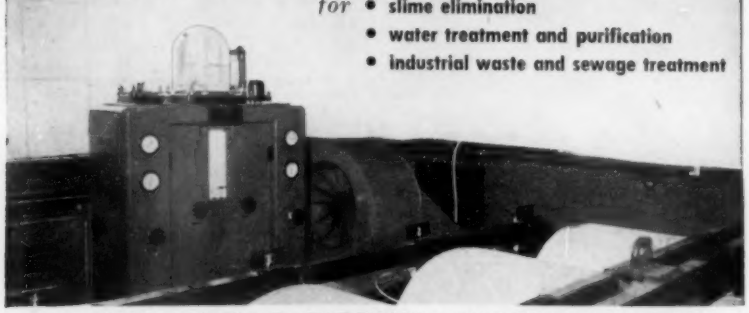

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CD-41

SHOWCASE . . .

New Literature

Pipe Coating, Testing, and Welding Services offered by a company are described in this new 28-page brochure. The brochure covers the conditions for processing and prices of all services of the company, including coating and wrapping, hydrostatic testing, threading and coupling, beveling, welding, A.P.I. drifting, straightening, and storage of pipe at the supplier's plant. **Write or call: Syd E. Culbertson Co., Inc., P. O. Box 9186, Houston 11, Tex., for brochure of services.**

●

Permanent Completion Drillable Packer described in this new four-page bulletin is suited for single or multiple-zone production for acidizing, flooding, pressure operations, and numerous other applications. Besides illustrations and descriptions of the packer and accessories, the bulletin includes detailed outlines of running and setting procedures along with surface-setting stroke tables for both 2 and 2½-in. tubing. **Write or call: Guiberson Corp., P. O. Box 1106, Dallas 21, Tex., for Type A drillable-packer bulletin.**

●

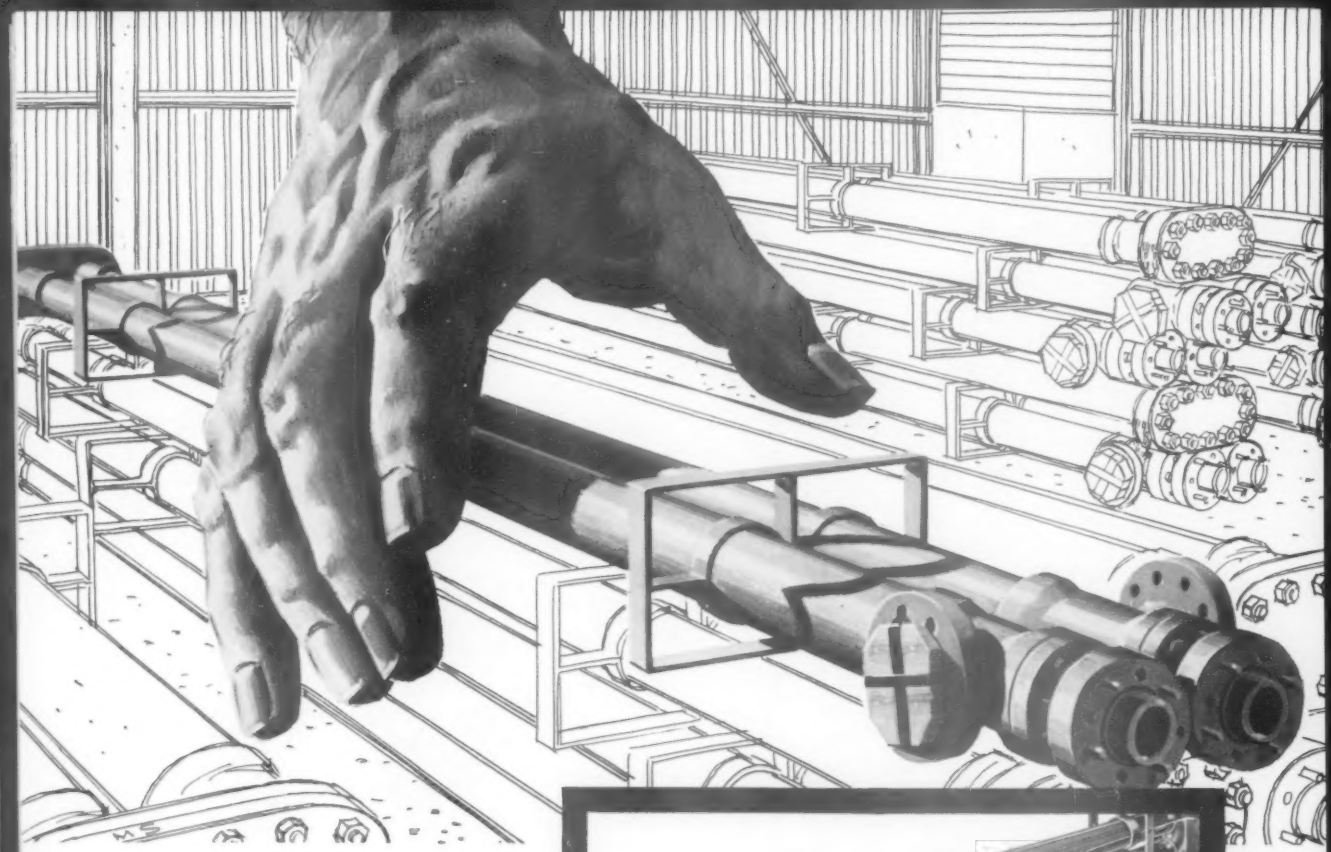
Mist Eliminators, their design, application, and performance are clearly described in this new 16-page manual. The manual explains and tells how to solve many liquid-entrainment problems in scrubbers, absorbers, evaporators, knock-out drums, cracking towers, and distillation equipment. **Write or call: Schuyler Mfg. Corp., 86 Porete Avenue, North Arlington, N. J., for Schulernit mist-eliminators manual.**

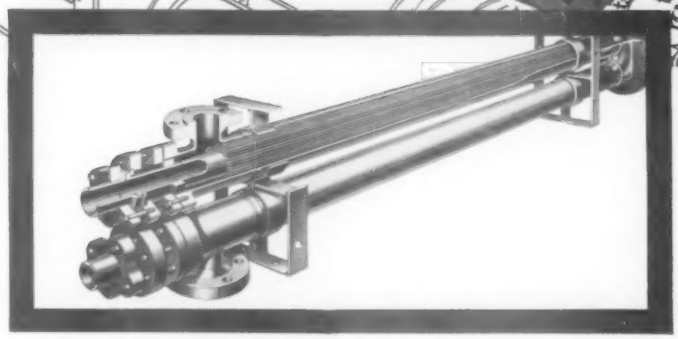
●

Gas Engines, one and two-cylinder units of 8 to 36 hp. for oil-field service, are described in a new eight-page Bulletin 368. The bulletin furnishes annotated views of the engine, a lubrication-system diagram, parts views, a cutaway view through the power cylinder, and horsepower-performance curves of each engine. In addition, it lists complete specifications, dimensions, and shipping data for the engines. **Write or call: Nordberg Mfg. Co., Milwaukee 1, Wis. for Bulletin 268.**

●

Vertical Turbine Pumps. This 72-page hard-bound book covers) the use of these pumps for industry. Section One is devoted to a study of the methods for selecting deep-well centrifugal pumps to attain optimum efficiency. Charts are included for determining the size





ALCOTWIN Heat Exchangers

Available from Stock Now

ALCOTWIN® heat exchangers are in stock in Beaumont for immediate delivery now. They are available in a number of sizes, for pressures up to 600 psi and temperatures to 650 F.

The flexibility of these "in-stock" ALCOTWINS gives them an unlimited range of uses. You can change load or processes within your plant and still use the same heat-exchange equipment. You can easily add new ones for increased load, or you can rearrange present ones for changing processes.

You select the exact ALCOTWIN for your job. The precise metallurgy needed for optimum results in your application can be selected on special order in an ALCOTWIN. The many combinations of tube and fin materials mean more efficient performance in high temperature services.

Complete information is available from any of ALCO's sales offices. For a copy of Bulletin FH-3, write Petroleum Industry Equipment Division, Dept. AW-2, P. O. Box 1065, Schenectady 1, N. Y.

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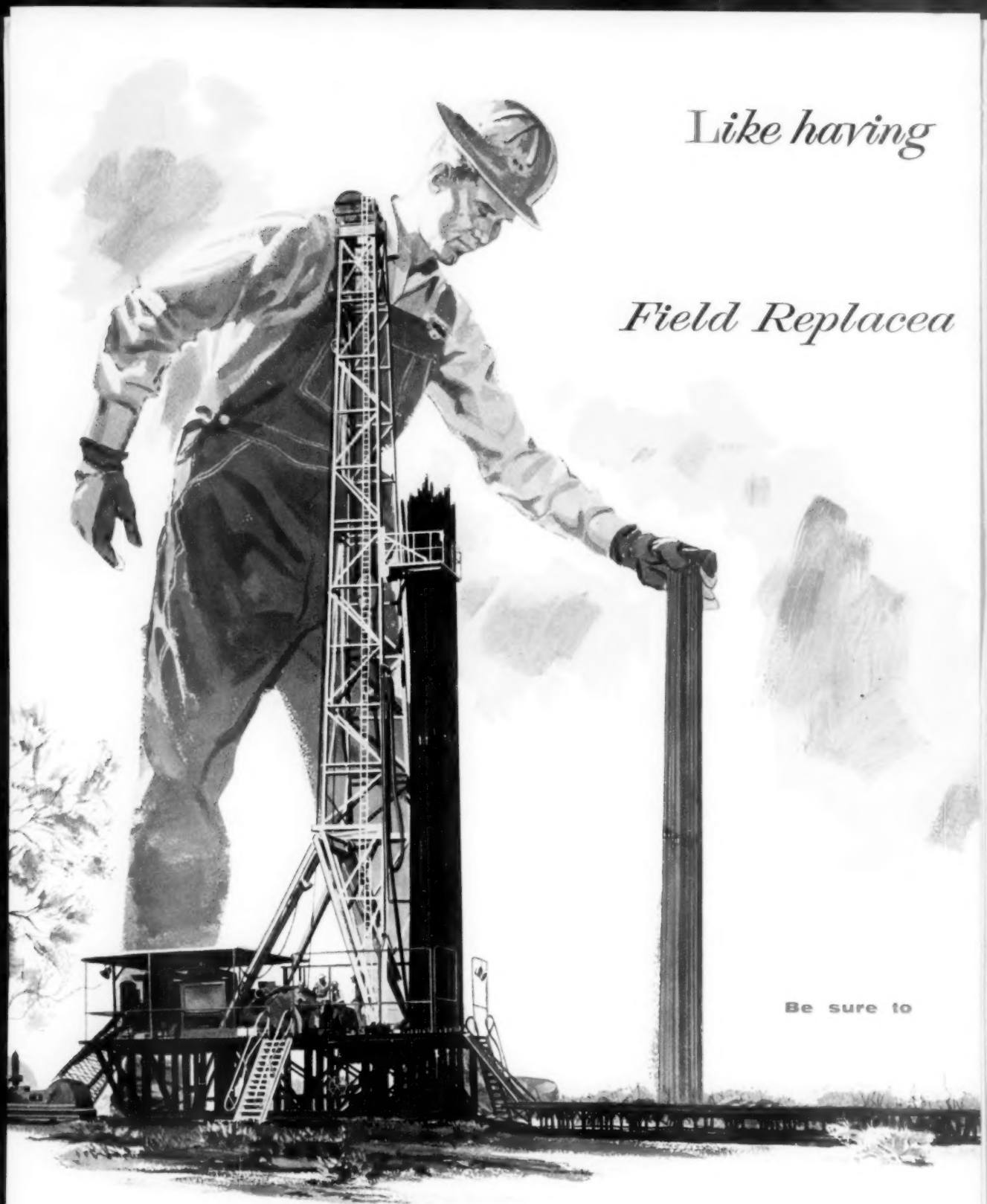


Like having

Field Replacea

Be sure to

. . . they're right for your rig

REED ROLLER BIT CO. • HOUSTON 1, TEXAS • Write or wire for complete information . . . or have your Reed

an extra drill string on location . . .

ble

REED
Super
Shrink-Grip

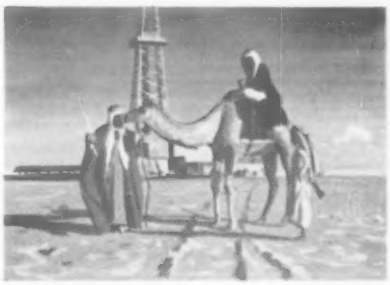
TOOL JOINTS!

A reserve drill string when you need it . . . without a costly inventory of drill pipe equipped with tool joints . . . this, in effect, is what you have with field replaceable Super Shrink-Grip tool joints. With a few extra Super Shrink-Grip tool joints, you can rework your drill string for maximum safety and performance right at the rig with your own labor . . . no costly abandonment of drill pipe or tool joint because the other part is damaged or badly worn . . . no transportation delays or shopping expense.

The versatile field replaceable advantage of the Reed Super Shrink-Grip tool joint makes good economic sense on any location . . . it is doubly important on the isolated rig . . .

specify REED SUPER SHRINK-GRIP tool joints

1. OFFSHORE . . . where storage space is at a premium, and self-sufficiency at the rig helps cut the enormous operating costs, Reed Super Shrink-Grip tool joints are the dependable answer to drill string economy.



2. FOREIGN . . . far from sources of supply, with the considerable shipping time and expense factors, Reed *field replaceable* Super Shrink-Grip tool joints on foreign rigs become even more vital to economical operations.

3. INACCESSIBLE . . . where the terrain presents difficult transportation problems, every piece of iron carried in must have maximum utility—here again *field-replaceability* of Reed Super Shrink-Grip tool joints makes them ideally suited for the isolated rig.

regardless of its location

man explain the economical and engineering advantages of Reed Tool Joints.

Get Higher Factor of Safety with New VHS Rotary Drilling Lines

• One of the many benefits drillers get with new VHS rotary drilling lines is higher factor of safety. For this new drilling line is 15% stronger than Improved Plow Steel—the strongest grade available before the introduction of VHS.

This means that 10 lines of VHS have a factor of safety 15% greater than 10 lines of the same diameter of IPS. Or, to put it another way, 10 lines of VHS have a factor of safety roughly equivalent to 12 lines of IPS.

TOUGHER, TOO!

New Lay-Set VHS is not only stronger, it's also tougher—and therefore it has higher resistance to peening, and greater resistance to abrasion. Both of these are important factors in maintaining shape and diameter. If regular adaptable cut-off practices are followed, ton-mile advantages should result.

CUT "DOWN TIME"

With new Lay-Set VHS you can drill deeper before increasing the number of parts of line. And VHS's extra strength eliminates, in many cases, any necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factor.

SIMPLE TO ORDER

You don't need any complicated specifications to order new Lay-Set VHS drilling lines. Just call your Hazard Distributor and tell him the length and diameter you want. He probably has it in stock —or he can get it readily.

for further information write to the nearest Hazard office for Brochure **DH-522**

LAY-SET VHS

15% Stronger • Tougher •

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.

630 McFarland St. Houston 1, Texas | 4555 E. 46th Ave. Denver 16, Colorado | 2216 S. Garfield Ave. Los Angeles 22, Calif. | 400 W. Madison St. Chicago 6, Ill.

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and type of vertical pumps operating from 585 to 1,750 r.p.m. The topics include centrifugal pumps for underground water, column life of deep-well pumps, and vertical short-coupled turbine pumps. Other sections set forth efficiency variations in deep-well centrifugal pumps and selection of deep well pumps. The text is supplemented with tables, photographs, drawings and charts to present a thorough reference book on vertical pumps. **Write or call: Layne & Bowler, Inc., Memphis 8, Tenn., for the book, The Answers to Your Questions About Layne Vertical Turbine Pumps.**

•

Drum-Making Machinery for making both square and round steel drums for gasoline and other fluids is described in this group of four giant-size leaflets. Made in England, the line of drum-making equipment includes sheet grinders, rolls, spot welders, seamers, flangers, and corrugators. **Write or call: Moon Bros., Ltd., Abbey House, 2/8 Victoria Street, Westminster, S.W.I., England, for leaflets on drum-making equipment.**

•

Small, Air-Cooled Diesel Engines are the subject of this new 30-page catalog. The catalog gives complete specifications on 20 basic prime movers and conversions, including portable and stationary generating plants, centrifugal-pumping plants, marine units, and diesel engines for many other purposes. It also includes installation data and profile drawings, performance curves, complete lists of available attachments and accessories, and detailed discussion of air-cooled small diesels. **Write or call: American M.A.R.C. Inc., 1601 West Florence Avenue, Inglewood, Calif., for catalog on diesel engines.**

•

Paints, Emulsions, and Coatings, a new pocket-sized folder, furnishes concise descriptions of eight roofing and dampproofing products for maintenance and repair purposes. The folder tells what the products are composed of and where each serves best in protecting roofs, foundations, and walls. **Write or call: Philip Carey Mfg. Co., Box 6304, Lockland, Cincinnati 15, Ohio, for folder, Paints, Emulsions, and Coatings.**

•

Electric Motor Selection Guide. Twelve-page, two-color Application Guide 102 makes it easy to select electric motors for most popular applications. Here's how this handy, illustrated manual can be used: First, the reader selects from tables in the guide the kind of equip-

NEW!

MODEL HL15-10

partlow

the pioneer in mercury thermal controls

Fast-acting precision limit control for protecting processing operations

- Ideal for positive high temperature limit control in processing of high-cost materials . . . protects against loss or damage to equipment or materials.
- Cuts off heat supply if pre-set temperature is exceeded.
- Element failure safety feature.
- Indicates process temperature at all times.
- Equipped with manual reset button.
- Fully adjustable over entire scale range.
- Available in scale and element ranges of 0 to 900°F. and 0 to 1100°F.
- For use with gas, oil, steam or water valves; or electrical equipment.

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THE PARTLOW CORPORATION

Dept. G-357 New Hartford, N.Y.

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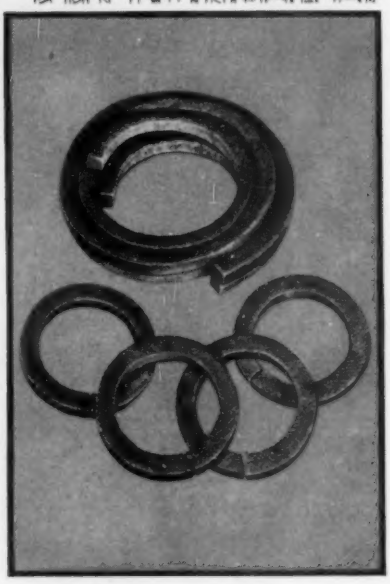

R/M UNIVERSAL PLASTIC PACKING...

No. 1 choice of the petroleum industry

R/M Universal Plastic Packing has won a reputation in refineries for keeping maintenance low and performance high. Composed of long-fiber asbestos, a special binder and nonfrictional metal, this packing does a top-flight job of sealing on centrifugal pump shafts, valve stems, reciprocating rods, and other equipment. It is recommended for use against gasoline, fuel oil, and other petroleum products.

This packing is available in standard sizes: 1/8 x 5/32 in. rectangular cross section; 3/16 to 1/2 in. round cross section; 1/2 to 1 in. square cross section; all in increments of 1/16 in. It can be had in both spiral and ring forms, butt or bevel cut.

R/M's engineering staff, with its wealth of experience in packing problems of all kinds, will be glad to assist you at any time. Write today for catalog on R/M Mechanical Packings and Gasket Materials.

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS—including Vee-Flex, Vee-Square, Universal Plastic, and "versi-pak"®; GASKET MATERIALS, "TEFLON"* PRODUCTS. SEE YOUR R/M DISTRIBUTOR.
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RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, PASSAIC, N.J.
MECHANICAL PACKINGS AND GASKET MATERIALS

FACTORIES: Passaic, N.J.; Bridgeport, Conn.; Manheim, Pa.; Neenah, Wis.; No Charleston S.C.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Mechanical Packings • Asbestos Textiles • Industrial Rubber • Engineered Plastics Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks Clutch Facings • Industrial Adhesives • Bowling Balls • Laundry Pads and Covers

ment or machinery to be driven. Then he identifies the character of the load, the speed of operation, starting and running torques, surrounding atmosphere, frame type, and speed, to arrive at the right motor for his specific application. **Write or call: Century Electric Co., 1806 Pine Street, St. Louis 3, Mo., for Application Guide 102.**

•

Pressure Centrifuge. Bulletin 2600 describes the features, design principles, operation, advantages, sizes, and capacities of a commercial centrifuge for high pressure operation. The six-page, two-color bulletin includes a cutaway drawing and photographs illustrating the unit and its components. The pressure centrifuge is available in two models with capacities ranging from 1 to 250 g.p.m. **Write or call: Dorr-Oliver Inc., Berry Place, Stamford, Conn., for Bulletin 2600.**

•

Truck Tanks, Semitrailers, and L.P.G. transportation equipment are featured in new Catalog 124. Additionally, the 28-page catalog describes a line of welded and bolted steel storage tanks in both vertical and horizontal types, underground storage tanks, and a prefabricated loading rack. It also describes a variety of bulk-plant accessories and a line of prefabricated all-steel industrial buildings. The catalog also illustrates and furnishes specifications for the equipment. **Write or call: Columbian Steel Tank Co., 1509 West Twelfth Street, Kansas City, Mo., for Catalog 124.**

•

Horizontal Pressure Filters. Publication 6322 (four pages) furnishes details on Cochrane large-volume horizontal pressure filters for use in industrial plants. The publication describes their operation, control, filter-bed materials, design features, and available accessories. And drawings illustrate various arrangements of two, three, and four-header units. **Write or call Cochrane Corp., Seventeenth Street below Allegheny Avenue, Philadelphia 32, Pa., for Publication 6322.**

•

Corrosion-Resistant Stainless-Steel Pipe, valves, fittings, tubing, and specialties are presented in this new 104-page-bound hard-back catalog. The new catalog thoroughly details the line of materials in photographs, cutaway and engineering drawings, charts, and text. **Write or call: Power Stainless Products Co., 356 Harrison Street, Passaic, N. J. for Catalog 157.**

EQUIPMENT MEN . . . in the News

Oilwell Names Dallas Manager of Derrick Sales

B. H. RAVANELL

The appointment of Ben H. Ravanell as manager of derrick sales, Dallas headquarters office of United States Steel Corp.'s Oil Well Supply Division, has been announced by M. F. Hazel, vice president of sales. Ravanell has served Oilwell as assistant division engineer at Dallas; division engineer at Denver, Colo., and Casper, Wyo.; in 1950 he was appointed division representative at Oilwell's Houston office; and in 1951 was named district manager at Edmonton, Alta., Canada, where he was located prior to his present appointment.

Homco Announces Ten Reassignments, Promotions

Edgar H. Dipple has been promoted from Midland sales to machinery sales representative at Houston for Houston Oil Field Material Co., Inc. Robert M. Dupree has moved from Freer, Tex., to sales at Victoria, Tex.; Crede R. Graham from Houston to division machinery sales engineer, Lafayette, La.; H. T. Hamm from assistant chief accountant to company controller; Raybon Herring from directional engineer to directional drilling sales and service engineer.

Harold Lott has moved from New Iberia to Morgan City, La.; John W. Magee to Shreveport, La., as residence manager; James R. Mouser from store manager, Freer, to residence manager, San Antonio, Tex.; John R. Parker from Houston to Midland as division sales engineer; and Gerald Shoemake from Carrizo Springs to store manager at Freer.

Rector Well Equipment Holds Annual Sales Meeting

Rector Well Equipment Co., Inc., held its annual sales meeting in Fort Worth recently. During the meeting the men were briefed on expansions planned for the plant and warehouse and on new equipment in the planning, development, and testing stages. Those attending were: (front row) Grady Cooper, Charles W. Zartman, Myrl O. Andrews, W. P. Knight, L. L. Rector, R. V. Evridge, C. L. Cron, M. C. Davis, J. L. Pinkard, and John L. Curry.

Second row standing: Robert Champion, John D. Sloman, T. C. McDonald, Paul Kittrell, H. M. Pilgrim, J. I. Thomas, C. L. Splawn, George H. Stewart, Bill McBride, Marvin R. Sargent, Jack Hunter, J. G. Wingfield, John R. Pinkerton, Richard R. Rector, Vanda Wright, John H. Horton.

Virginia Jarvis, Wilma Thomas, Edna Lacy, Winifred Roberts, Paula Haider, R. B. Yanaway, J. B. Fanning, A. J. LaBate, Eugene L. Beaupre, William R. Singletary, Frank Blanton, James I. Norton, Jack Myers, John W. Freeman, Wallace R. Tipsword, Al Herndon, George Hitzfeld, James L. Wilson, and Gordon McHan.

Bethlehem Supply Holds Annual Sales Conclave

Bethlehem Supply Co. held its annual sales meeting recently at Western Hills Lodge near Tulsa. Discussions covered drilling and production equipment as well as the general sales activities.

Attending the meeting were: (front row) I. C. Smith, general manager of sales; E. R. Phillips; J. F. Eaton, vice president of manufacturing; J. V. Spalding; C. R. Zimmerman, executive vice president; H. A. Wilson; J. B. Ellzey; J. G. Floyd; F. R. House; R. B. Dearing; G. A. Tompson, president; C. C. Crider, general manager of stores; Christian Seger, Jr.

Middle row: H. V. Harder; O. H. Crowe; Arthur Weber, Jr.; E. S. Lewis; V. W. Bailey; W. E. Stephenson; H. L. Hawkinson, Jr.; R. A. Johnson; G. B. Sager; Lee Fagg; W. F. Taylor; C. R. McNair; W. J. Brady.

Top row: H. R. Powers, assistant general manager of sales; W. T. Davis; T. C. Graham; Wendell M. Jones; D. C. Thomas; H. E. Arnold.

Others attending the meeting but not pictured were H. G. Evans, W. B. Cotton, V. G. Stahl, H. E. Davidson, L. G. Bettis, F. I. Mobley, L. A. Myers, C. H. Wilmeth, G. L. Reid, and W. M. Sanders.

Nordberg Names Manager of Power Chief Engine Dept.

H. E. FELLOWS

Appointment of H. E. (Bud) Fellows as manager of the Power Chief engine department to succeed G. B. (Burke) Wright is announced by R. W. Bayerlein, vice president, Nordberg Manufacturing Co. Wright, who headed the department since 1950, has been named district manager of the company's Great Lakes territory and will concentrate on the sale of heavy-duty Nordberg two-cycle and four-cycle engines for stationary and marine applications.

Fellows joined Nordberg in 1950 and formerly was manager of the gasoline marine engine department. He headed this department for the past 3 years and previously was assistant sales manager of the department.

Wes E. Park and Phillip R. Coerper will continue as sales engineers with the Power Chief diesel and gas engine department.

Magcobar Strengthens Offshore Divisions

Further bolstering of its divisions responsible for providing drilling-mud

services to offshore operators has been announced by Magnet Cove Barium Corp.

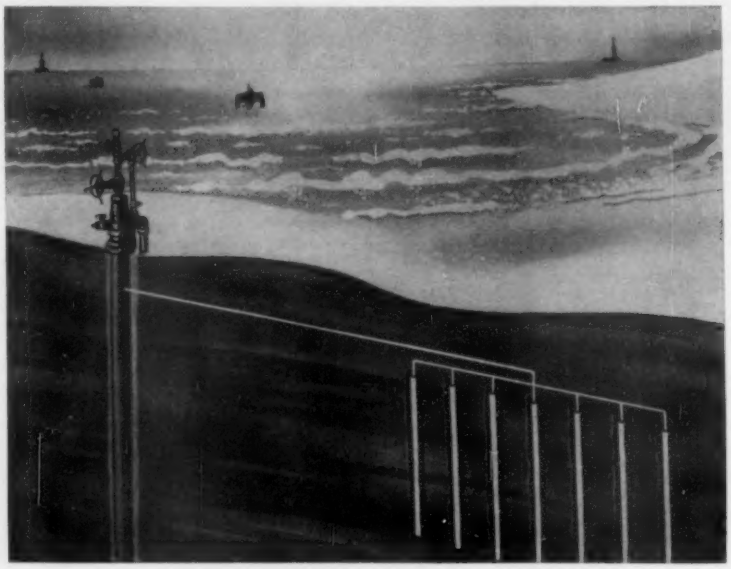
Additions to the staff of Magcobar's new Louisiana offshore division have increased the employes in that division to 54. The strength of the Texas Gulf Coast division also has been increased.

Magcobar's offshore divisions are designed to give a more concentrated and efficient service to Magcobar customers and are comprised of specialized service engineers, according to Frank Loe, drilling-mud sales manager.

Seven Magcobar dealers operate offshore from 18 Louisiana locations and 3 dealers from 7 Texas locations. Each dealer provides his own transportation equipment, owning some barges and boats outright, while leasing others.

Magcobar Louisiana offshore division is under R. E. (Rags) Hinchliffe and is headquartered at Lafayette, La. It consists of three strategically located districts: district 16 at Lake Charles with Bill Glasspool as district manager; district 17 at Houma with Robert L. Vannoy as district manager; and district 19 at New Orleans with Ken Begley as district manager.

Drilling operations offshore Texas will continue to be serviced by the Texas Gulf Coast division under C. H. Sydow, Jr.



CASING IN 62 OIL WELLS PROTECTED FROM CORROSION

Here's how an oil producing company on the Gulf Coast stopped external casing corrosion on 62 of its wells. Five of the wells were in a salt water bay.

Potential-drop profiles indicated that cathodic protection could be applied to the total depth of 5,500 feet. CSI determined the current requirements, using the log current-potential method.

Then CSI engineers designed and installed a protective system for each well based on a guaranteed current output. The range of current requirements was from 0.5 to 6.2 amperes. The necessary current was delivered from ground beds each containing from two to 16 magnesium anodes. Galvomags, Dow's new high potential anodes, were used in special lengths to provide 10-year installation life at the lowest possible cost. This cost ranged from $215 to $510 per well.

Call or write today for estimates or quotations on your cathodic protection needs—materials or services No obligation.

CSI

CORROSION SERVICES INCORPORATED
Tulsa, Oklahoma

P. O. Box 7343, Dept. J4 Telephone: Circle 5-1351

Four Promotions Made by Mid-Continent Supply

R. O. MOORE

W. A. SELLERS

J. P. JONES

G. B. BLAIR

Newly appointed general manager of buildings and construction for Mid-Continent Supply Co. is R. O. Moore, former general mechandise manager. Assuming new duties as general merchandise manager is W. A. Sellers, formerly assistant to general division manager.

J. P. Jones is new assistant to general division manager. He formerly was assistant to general manager of sales. Assuming a new position in the Fort Worth offices as assistant to general manager of sales is G. B. Blair, former Shreveport district manager. These appointments were announced by Ken W. Davis, Mid-Continent president.

Moore is a veteran of 23 years of service with Mid-Continent and has been in the Fort Worth headquarters since 1937. Sellers, who has been with Mid-Continent since 1948, moved to Fort Worth headquarters in 1956 from the company's West Texas-New Mexico division.

Jones has been with Mid-Continent 15 years and served in the company's Gulf Coast division before moving to Fort Worth in 1956. Blair, who has been at Shreveport since 1951, has been with the company since 1937.

J&L Supply Moves Fort Worth Sales Office

Rainey Elliott, president of Jones & Laughlin Supply Division headquartered in Tulsa, has announced the recent move of the firm's Fort Worth, Tex., sales office to the Continental National Bank Building.

Sales personnel based in the Fort Worth office include R. Z. Dallas, office manager, and Rawley Angerstein, sales representative for the area.

French Representatives Visit T. D. Williamson Plant

Gaz de France and La Societe Nationale des Petroles d'Aquitaine have sent representatives to the United States to study American pipeline company methods of construction and operation.

Accompanied by Rene Berg, president of Premafrance, Paris, American Premaberg Co., Inc., New York, and the European representative for T. D. Williamson, Inc., Tulsa, the French group has been visiting various pipeline construction projects in progress, and officials of pipeline companies throughout the United States.

Stopping in Tulsa for several days, the men visited the factory of T. D. Williamson, Inc., to study the use and application of the latest pipeline scraper tools, equipment for insulating pipelines in casings under highways and railroads, and the adaptation of tapping machines and stopples to the new pipeline.

Viewing a Model 1200 WmSon-Hillco tapping machine, are Rene Berg; Jean Penaud; Jean Tellier, in charge of study for Gaz de France; Rolland Nory, in charge of construction for Gaz de France; T. D. Williamson; Andre Amsler, in charge of project for Gaz de France; and Jean Dhuin of SN&PA.

In addition to visiting Tulsa, the men stopped at Dallas, New Orleans, Houston, Corpus Christi, Shreveport, Memphis, and Chicago before returning to France.

Grant-MacClatchie Has Expanded Quarters

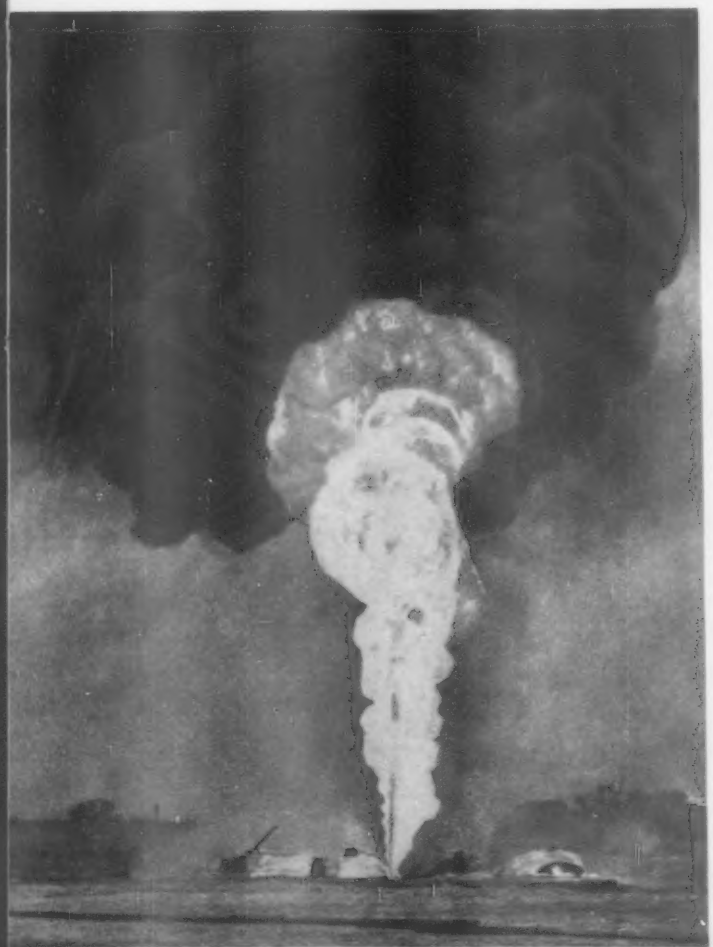
In a move to increase service facilities in the growing Gulf Coast area, Grant Oil Tool Co. and its affilate, MacClatchie Manufacturing Co., have completed new, expanded

quarters at Lafayette, La. The building houses the shop, warehouse and offices. A full line of Grant and MacClatchie drilling and production equipment is stocked. Around-the-clock service is offered to meet all oil-field needs. This branch complements other established Gulf Coast facilities in Harvey, La., and Houston.

B. R. (Ray) Fairchield continues as manager of the Grant-MacClatchie Lafayette branch.

Lane-Wells Co. To Develop Logging Method

A plan to incorporate the new actinium neutron source developed recently by Well Surveys, Inc., Tulsa, into the neutron logging instruments of Lane-Wells Co. has been announced



Sub-Surface Protection
Against Wild, Uncontrolled Flow

OTIS
TUBING
SAFETY
VALVES

OTIS/Branches Throughout the Oil Country

by James D. Hughes, Lane-Wells' vice president of sales and service. Both companies are Dresser Industries' organizations.

The actinium source is advantageous in neutron logging because it emits a high neutron flux with a relatively small gamma ray emission. In currently available logging instruments throughout the industry, difficulty exists in emitting neutrons without gamma ray. The new actinium-beryllium source, with its small gamma ray emission will correct this difficulty.

Company officials say, "Lane-Wells has been helping to field test the Well Surveys, Inc., actinium-beryllium source for over a year and it has repeatedly demonstrated the anticipated advantages."

J & L Supply Promotes Miller and Selinger

Malcolm B. Miller has been made local store manager of Jones & Laughlin Supply Division's oil-field supply store at Longview, Tex. R. A. Selinger has been promoted from storeman to local store manager at Swift Current, Sask., Canada. These promotions were announced by A. G. Bastian, manager-field sales division.

Miller joined J&L Supply in 1952 as a storeman at Chase, Kans., where he served until his transfer to El Dorado, Kans. Selinger has been with the division's Swift Current store since his employment in 1955.

Welex Field Men Complete Week-Long Logging Course

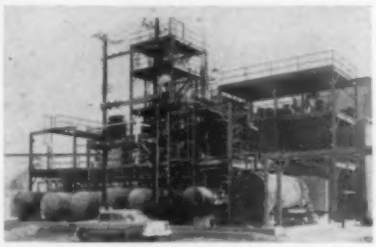
Two groups from the West Texas and Rocky Mountain divisions of Welex Jet Services, Inc., have completed a radioactivity logging school. First graduates of the course were: E. B. Schulz, manager of the Snyder district; Jack E. Brown, manager, Cortez Colo.; Ben L. Hays, manager, Farmington district; Gilbert Hester, manager, San Angelo district; Benton Riddel, manager, Abilene district; Paul E. Ganus, sales engineer, Farmington; Don Biles, sales engineer, Hobbs; and Brad Hartshorn, sales engineer, Farmington.

Included in the second group were: L. M. Robertson, manager, Kimball, Neb., district; L. M. Wood, assistant manager, Abilene district; H. D. Foster, assistant manager, Wichita Falls district; E. M. Elbert, assistant manager, San Angelo district; Jerry Rushmore, assistant manager, Pampa district; C. C. Seamon and E. B. David, sales engineers, Farmington; and J. C. Willis, radioactivity logging operator for the Hobbs district.

The school, open to field personnel, is conducted by Floyd D. Sawyer, Welex manager of radioactivity logging sales, and L. A. Ingram, Welex chief radioactivity logging engineer. Instruction is given in every phase of radioactivity logging, including techniques, tools and interpretation and analysis.

Davison Completes Reforming Catalyst Plant

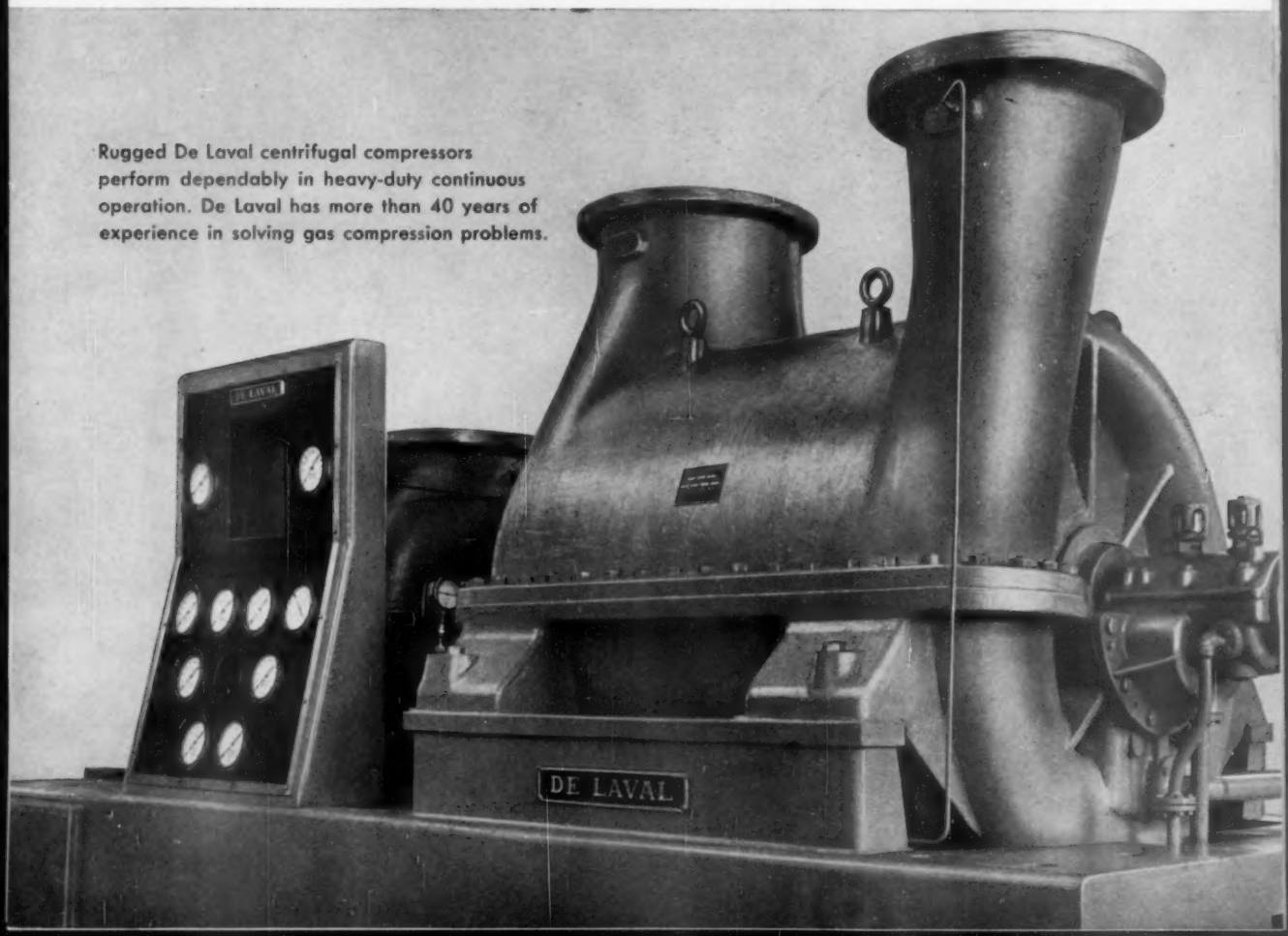
Davison Chemical Co., division of W. R. Grace & Co., has completed a new $1,500,-



000 plant at Curtis Bay, Baltimore, Md., to process reforming catalyst for petroleum refineries.

Capacity of the new facility is approximately double that originally projected. Partial production began in early summer of 1956, followed this year by full operation.

Rugged De Laval centrifugal compressors perform dependably in heavy-duty continuous operation. De Laval has more than 40 years of experience in solving gas compression problems.



Security Appoints Birnie Executive Vice President

A. M. BIRNIE

The appointment of A. M. Birnie as executive vice president for Security Engineering Division has been announced by C. L. Lane, president of the Dallas-based petroleum-equipment company. Birnie, who was formerly vice president and general sales manager, will continue in his capacity as general sales manager and also assume the responsibility for field engineering activities.

Birnie joined Security in 1944 as a field engineer. He was named a district manager in 1945, Mid-Continent manager in 1947, and vice president and general sales manager in 1952.

Alco Acquires Houston Site For Oil Equipment Plant

Alco Products, Inc., has announced the acquisition of a new industrial site in Houston as the eventual production center for the company's growing petroleum industry equipment business.

The company at the same time announced the establishment of its petroleum industry equipment division headquarters, together with the relocation of its district sales offices. Additional internal organizational changes in line with the recent creation of the petroleum industry's equipment division also were announced.

The new 107-acre industrial site is located on Almeda Road near Riley Road. The company hopes to commence construction in the not too distant future. Alco will probably start with a small manufacturing facility and then will expand.

Alco currently manufactures heat exchangers, finned-tube products, wellhead equipment and specialty valves at its Beaumont, Tex., plant, which is part of the newly established petroleum industry equipment division.

Recently new headquarters for the petroleum industry equipment division were established in the Bank of the Southwest in downtown Houston.

Under the new administration of the division, three managers and the division accountants will report to C. C. Davis, division manager. They are E. N. Sieder, marketing; E. F. Cooke, Jr., product development engineer. C. H. Homer, Jr., is plant manager. Sieder, who will make his headquarters in Houston, is marketing manager for the company's thermal products, with offices at Schenectady.

Mid-Continent Sales Mgr. Appointed by Win-Well

B. CADENHEAD

The appointment of Bob Cadenhead as Mid-Continent district sales manager for Win-Well Manufacturing Co., Los Angeles, has been announced by William B. Pollock, president. Cadenhead was formerly sales manager of American Kloeckner-Moeller Corp. of Tulsa and previous to that had been a sales representative in the valves section of Hinderliter Tool Co., and a salesman for Mid-States Supply Co.

With headquarters in Tulsa, Cadenhead will supervise sales and service activities of Win-Well's sales representatives in Oklahoma, Kansas, Missouri Illinois, West Texas and New Mexico.

DE LAVAL
CENTRIFUGAL COMPRESSOR

helps boost cat-cracker capacity at Shell Oil of Canada, Limited

To obtain extra capacity, the Montreal East refinery of the Shell Oil Company of Canada, Limited decided to rebuild its cat-cracker. Since the modernized cracking unit required a greater volume of air, Shell of Canada selected a dependable De Laval centrifugal compressor handling 16,400 cfm.

This compressor operates at an inlet pressure of 14.3 psia and a discharge pressure of 42.8 psia. The power required is 1860 bhp with the compressor operating at 5400 rpm.

The Shell Oil Company of Canada, Limited is another refinery which has chosen De Laval compressors for heavy-duty continuous service. Whether you need to handle light or heavy gases at high or low pressures in catalytic cracking, reforming, alkylation, coking or any similar service, it pays to look to De Laval.

Send for Bulletin 0504

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL378

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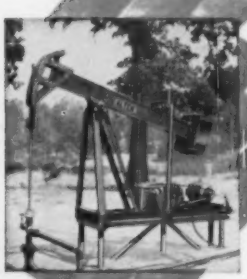

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EXPLORATION

"Let's Try A Fresh Approach"

. . . A.A.P.G. leaders urge

by Frank J. Gardner

ARE you "in the groove" . . . or simply in a rut? .

Ted Link, affable president of the American Association of Petroleum Geologists, startled 2,000 geologists with that question a week or so ago in Salt Lake City. In a major address on the second day of the seventh annual meeting of the Rocky Mountain Section of the A.A.P.G., Link started many a rockhound on a round of introspection and self-analysis. Only the day before, A. I. Levorsen, an ex-president of the association, had told them to "get off the top of the structure" if they wanted to find more oil. Levorsen's positive advice was enough in itself to start some mental gymnastics, but Link's barbed question really hit where it hurt.

New ideas . . . For it is true that many geologists are in a rut as far as their discovery thinking is concerned. Too many are inclined to be satisfied with the status quo. Too few find reason to question accepted theories that might better go. Time and again, geologic thinking has been veered in new directions just by a simple idea. And today, when finding oil becomes ever tougher, the need for new ideas is great.

But this lethargy of geologic thought seems to be affected by environment. You can feel it in the air as you travel from one part of the country to another. You can feel it at a luncheon meeting of the local geological society. And you can sense it in the faces of the geologists you talk to. There is enthusiasm, or there is none. There is curiosity, or there is none. In the older, so-called "settled" areas of production, the lethargy hangs heaviest; in the newer, unexplored areas, enthusiasm runs high.

CANADIAN WILDCATTERS are engaged in a vigorous northward push from settled areas of production in the western provinces. Prime target is the granite wash, productive pay at Red Earth.

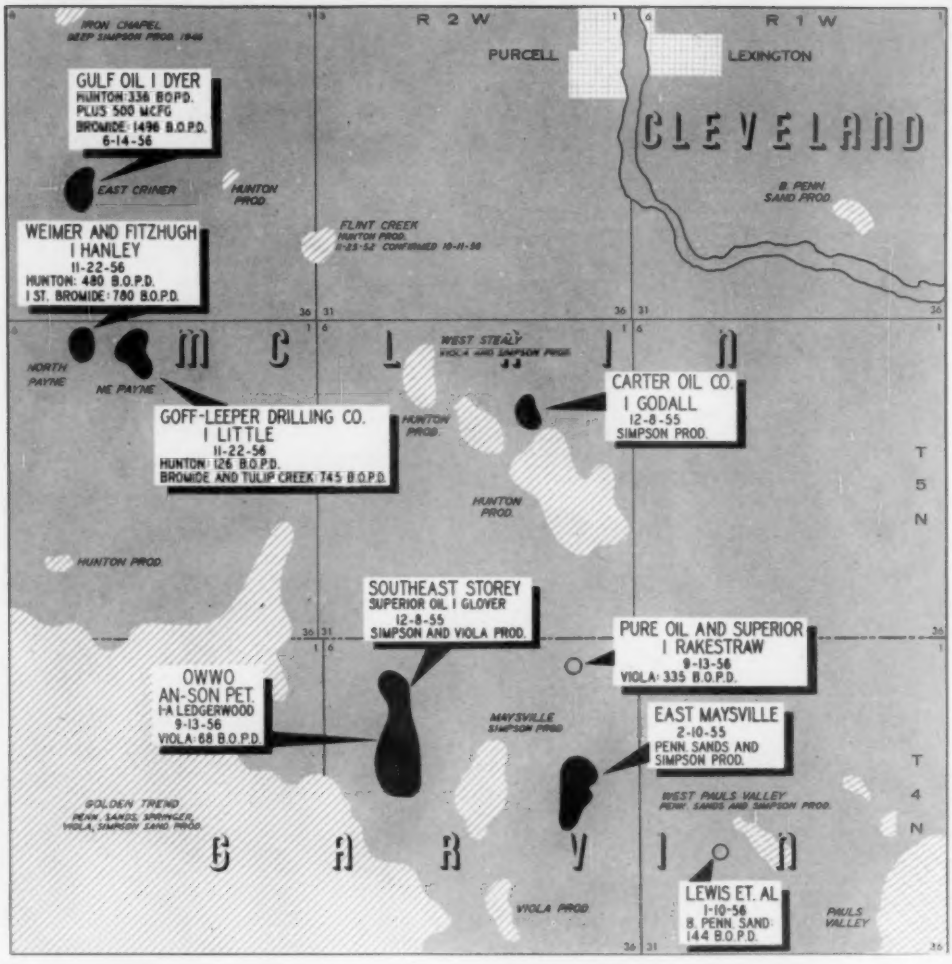
And a change of scene . . . Link pointed up this situation, too. "I sometimes think that the best way to boost oil-finding success would be to ship all the Texas geologists to California, and vice versa." Naturally, this drew a laugh, but the geologic truth that underlies the jest should not be ignored. There is ample evidence that a change of scene is the most effective challenge to an oil finder's ability, and more often than not, the capable man can meet that challenge. Some informed people point for proof to the high casualty rate among geologists who move from "easy-geology" country to more complex areas.

If we were asked to name the "enthusiasm capitals" of the geologic world today, the answer would come easily — the Rocky Mountains, and western Canada. Nowhere is the challenge greater. Nowhere is the promise larger . . . and nowhere is success more prevalent. These two vast provinces are teeming with activity, and the activity in every case is preceded by original geologic thought.

That Rocky Mountain and Canadian geologists are thinkers was well demonstrated at Salt Lake City. Of the 26 papers delivered there, 20 were concerned directly with detection of the stratigraphic trap.

Means progress . . . Bruce Curtis, of Continental Oil Co., Denver, told the delegates that there are now 299 fields in the Rocky Mountain area that produce from stratigraphic traps; of these, 77 per cent are in Cretaceous sands of the near-shore type. In recent years, he said, the number of strat traps discovered has increased markedly. This is evidence enough that geologists are making great progress in their ability to spot such traps.

As for the Canadians, a glance at the map on this page is evidence enough of **their** enthusiasm. There is a great northward push under way in western Canada, away from the proven territory into the bush country. All of the wildcats spotted on the map, some drilling and some now finished, are probing for new fields in new, remote country. The play was triggered by Union Oil Co. of California's Red Earth strike in 1956, but whether Red Earth had happened or not, this play was bound to come, for Canadians are convinced that they are in the groove and not in a rut. **End.**



RECENT deep Simpson discoveries in McClain County have uncovered a new fault trend north of Oklahoma's Golden Trend. These discoveries plus other recent successes shown on the map, make these nine townships important to drilling contractors and oil companies. Fig. 1.

Oklahoma's Golden Trend Yields Deep Pays

by Norman S. Morrisey
Drilling-Development Editor

KEY Simpson discoveries on Oklahoma's Golden Trend are keeping rigs busy in Garvin and McClain counties, Oklahoma. Latest in the string of prolific successes are a pair of multipay wildcats.

Goff-Leeper Drilling Co. recently completed its 1 Little (NW SE 4-5n-3w) with three pay zones opened through perforations, the Hunton limestone and the Bromide and Tulip Creek sands. And only 1 mile to the west, Weimer and Fitzhugh in the same week brought in a dual-zone discovery, the 1 Hanley (SW NE 5-5n-3w). In the Hanley, the Hunton flowed 480 bbl. per day, and the first Bromide sand yielded 780 bbl. per day.

It is significant that the same zone or zones produce in both wells. The question immediately arises, "Are these wells producing from the same structure?" The answer is "No" because subsequent wells have established different oil-water contacts in the two first Bromide producing areas.

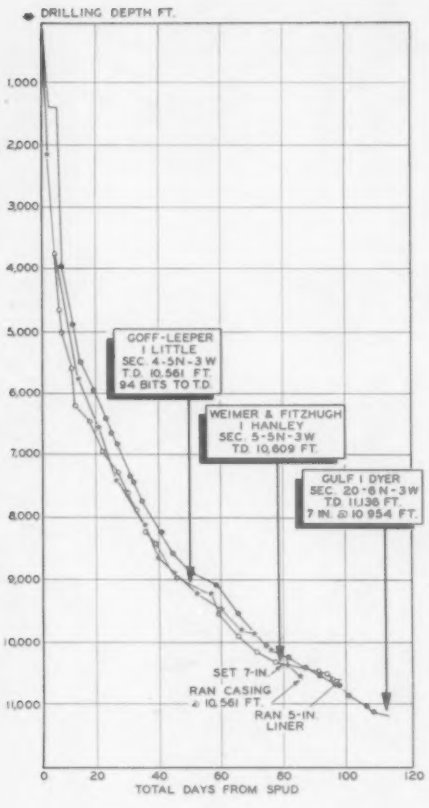
The western well, the Hanley, is nearly 700 ft. lower than the Goff-Leeper 1 Little on the top of the Viola limestone. And this fact, coupled with the different oil-water contacts, indicates two structures,

Certainly the new discoveries, along with a mid-'56 bonanza, the Gulf Oil Corp. 1 Dyer (NW NE 20-6n-3w), are uncovering a new deep trend that will take many months to develop. The Dyer, too, produced from both the Hunton and Bromide and at the time was heralded as one of the most significant discoveries in Oklahoma for 1956. The latest developments confirm the importance of the new trend play.

But these wells are only the latest in a series of successes that have uncovered eight new oil fields in the past 2 years on the northwest flank of the Pauls Valley uplift. With the trend toward deeper drilling in the area, operators are now concentrating on finding Simpson (Ordovician) reserves rather than the Pennsylvanian sands that originally made the Golden Trend so famous in exploration circles.

Drilling . . . Considerable time is spent in coring and testing at the present time

"Of the three deep discoveries, total drilling time to 10,000 ft. averaged 71 days."



FEW drilling problems were experienced on these three key discoveries in McClain County. Notice the similarity of the curves. Considerable time was spent in coring and testing in these wells. Fig. 2.

in the newly discovered fields. Some operators core all potential pay zones if shows in the samples warrant. And this is a time-consuming operation. Of the three deep discoveries (see Fig. 2) total drilling time to 10,000 ft. averaged 71 days. Goff-Leeper Drilling Co. used a total of 94 bits on the 1 Little to reach 10,561 ft.

The field wells at North Payne and Northeast Payne in 5n-3w require between 75 and 95 days depending upon the drilling depth. In the western field, North Payne, the first Bromide sand is 700 ft. lower than at Northeast Payne.

Pay Zones

This part of Garvin and McClain counties is noted for its numerous pay zones. And exploration has experienced several cycles, depending upon what pay zones were emphasized at the time. Today principal stress is placed on deep Simpson reserves. But since 1945 operators have played sand pinchouts in the Deese section, truncated Hunton production in the Maysville area, Simpson production along fault trends, etc.

Currently the emphasis is on deep production with drilling depths as great as 10,500 ft. to some of the lower Simpson sands in T5-6n-R3w. In these two townships, both the Hunton and the Simpson are prolific producers. Actually, the Simpson has several potential pay zones; any of these sands may produce and in some instances two or more will be oil bearing on the same structure.

Goff - Leeper's discovery (4-5n-3w) established production in the Hunton, first Bromide, and the Tulip Creek. The well was originally a dual completion from the Hunton and Simpson with the two Simpson sands commingled.

Deese sands . . . Numerous sands in the lower part of the Deese are productive and these were the primary target during the early drilling campaign on the Golden Trend. Principal sands are the Gibson and Hart. Recently Lewis et al completed a basal Pennsylvanian sand discovery (29-4n-1w).

Hunton . . . Production from the Hunton is not nearly as important as it is in Short Junction field, 30 miles to the north. At Short Junction, the Hunton produces at the unconformity where it has been eroded deeply. Similar production does occur at South Stealy and Southwest Wayne (4n-2w), but generally speaking, the recoveries in these fields has been relatively low when figured on a barrel-per-acre basis. Prolific flow tests from the Hunton have been reported in newly discovered Northeast Payne, North Payne, and East Criner fields. MicroLogs show 34-38 ft. of pay in the upper part of the Hunton, the Bois d'Arc limestone, the producing zone, in these three fields.

. . . If the Hunton proves economic, the numerous small Hunton producing areas will be developed. This is already taking place at Flint Creek (30-6n-2w and 25-6n-3w). The discovery well was drilled by Big Chief Drilling Co. in 1947. However, the field was not confirmed until September 1956 when Perkins Production Co. completed a Hunton oil well, ½ mile southwest of the discovery. Carter Oil Co. is currently reworking a Simpson oil well, the lone producer in Northwest Flint Creek field (23-6n-3w). Operator is plugging back to recomplete in the Hunton. This zone tested 47 bbl. of oil in 6 hours after fracture treatment.

Viola . . . Although not a primary target, there are several Viola pools shown on the map. Pure Oil Co. and Superior completed a Viola discovery, the 1 Rakestraw (2-4n-2w) for an initial potential of 335 bbl. per day. And An-Son Petroleum Co. successfully reworked a dry hole on the east edge of Southeast Storey field and completed it in the Viola for 68 bbl. per day, September 1956.

Simpson production . . . The Simpson section has several sands that produce in many fields in southern Oklahoma as well as in the area outlined in Fig. 1. These zones produce on structures although stratigraphy may play a minor role. Several of the sands can be traced and correlated for great distances in the subsurface.

Many of the Simpson producing areas are related to faulting and production on the downthrown side of a north-south trending fault is common. The recently discovered production at Southeast Story apparently is related to a fault line trend. Similarly, the East Maysville producing area may have a fault along its east flank, separating a high dry hole from low producing wells.

Faulting probably separates Northeast Payne and North Payne fields. This conclusion, as mentioned earlier, is based on the different oil-water contacts in the two areas and the abnormally steep dip. North Payne is approximately 700 ft. lower on the top of the Viola than Northeast Payne. Apparently the north-south trending fault systems of the Golden Trend extend into the Payne and Criner areas. The production is related to fault closure, although more often than not, it is almost impossible to detect the faults, because wells seldom cut the fault plane. **End.**

EXPLORATION HIGHLIGHTS

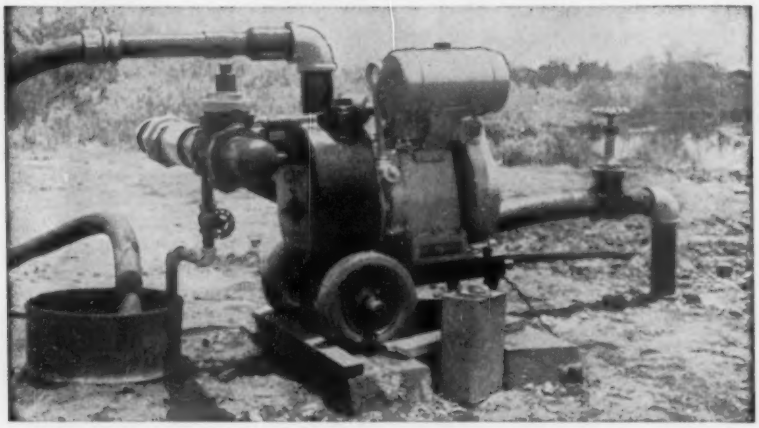
APPALACHIAN

OHIO

E. M. Shields' second attempt to find production near dry holes in the southern part of Clayton Township, Perry County, was not equal to his first. The 1 (3) Callie Dugan, Section 32, logged the Clinton at 3,274-3,336 ft. and gaged 225,000 cu. ft. gas and 25 bbl. oil in 24 hours after fracture.

● South of Fallsburg in Fallsburg Township, Licking County, Allen Willey 1 (2) T. C. McClay, Section 24, found Clinton at 2,865-2,908 ft. with a production of 50 bbl. daily after fracture.

● A. Diloreto 1 Frank Craig, Section 2, Hopewell Township, Muskingum County, a semiwildcat, 1 mile south of Hopewell, gaged 90 bbl. in a 24-hour test after the second fracture from Trenton at 3,376-3,423 ft.



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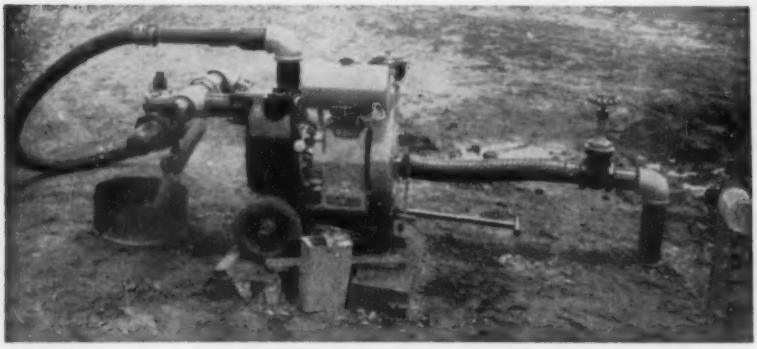

PENNSYLVANIA

In Gaskill Township, Jefferson County, Southwest Pennsylvania, Columbian Carbon Co. 2-1838 Harriett C. McClure, wildcat, resulted in 400,000 cu. ft. gas after second fracturing. Onondaga 7,372 ft., chert 7,392-7,410 ft. gas. Total depth 7,604 ft.

WEST VIRGINIA

In Dry Fork district, Randolph County, West Virginia, Hope Natural Gas Co. 10,000 U.S.A. Department of Interior, elevation 3,385 ft., tested 589,000 cu. ft. of gas after second fracturing, chert 5,627-5,761 ft., Oriskany sand 5,844 ft., gas 5,971 and 6,011 ft. Total depth 6,144 ft.

EASTERN KENTUCKY

In Wolfe County and located on Holly Creek in the Landsaw Quadrangle, United Carbon Co. has reached a depth of 4,777 ft. on its rank wildcat, 1 Blaine Rose. Test is thought to be in the Knox section or lower, of Cambro-Ordovician age, but top of same has not been announced. The well previously topped Corniferous lime at 1,357 ft. and had a good show of gas 1,357 to 1,374 ft. Test is currently shut down for orders at 4,777 ft.

CALIFORNIA

Deep Fillmore Field Extended to East

The deep Fillmore field in Ventura County was extended ½-mile east of the nearest production last week by Richfield Oil Corp. with completion of 1 McNab in SE NW 25-4n-20w.

Richfield selectively perforated the 14,020-ft. wildcat in two intervals at 13,765-13,805 ft. and 13,950-13,965 ft. Initial production was flowing 800 bbl. daily of 33°-gravity crude. Settled production is expected to level at 400 bbl. daily.

Richfield now joins Standard Oil Co.

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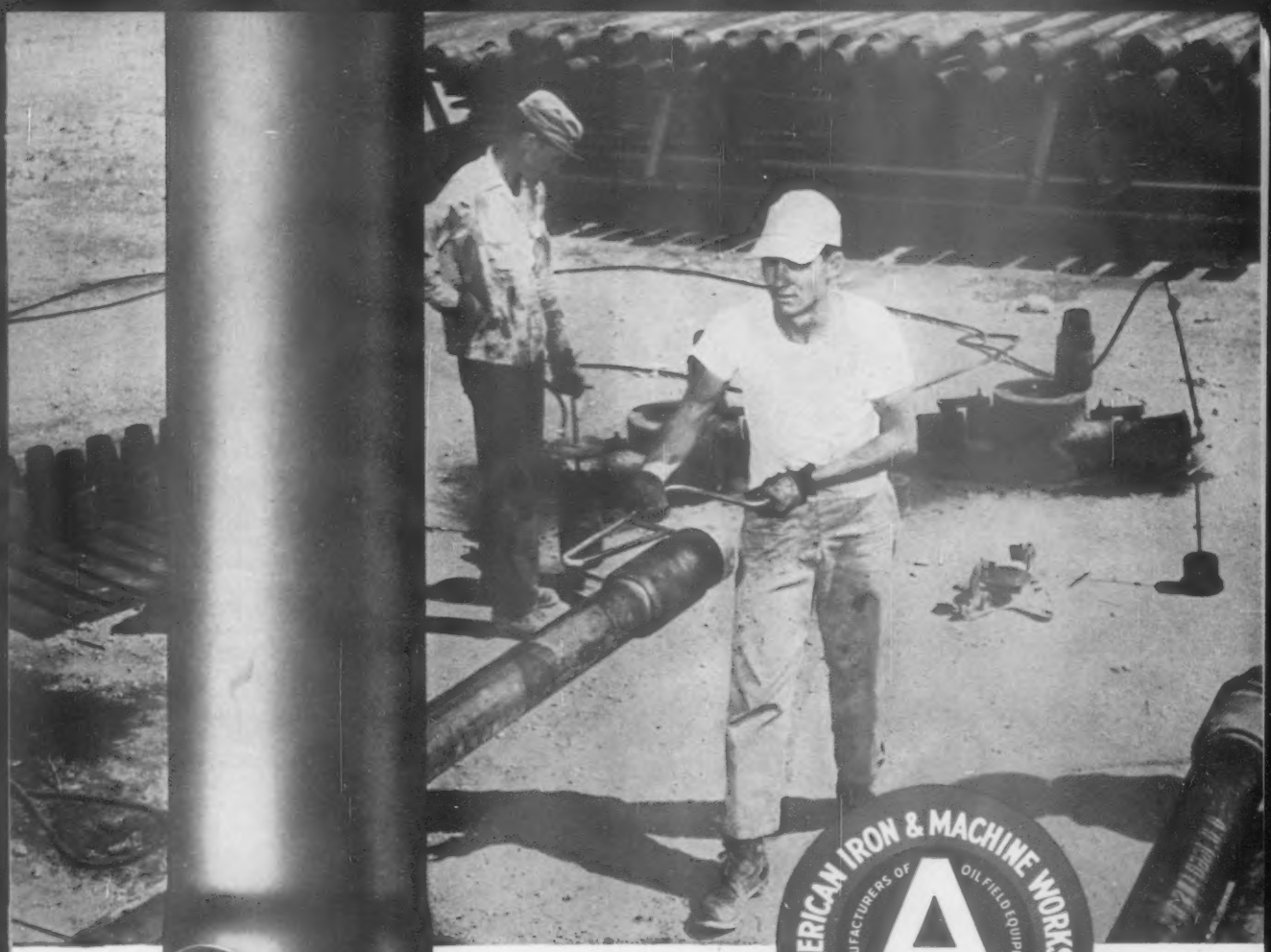

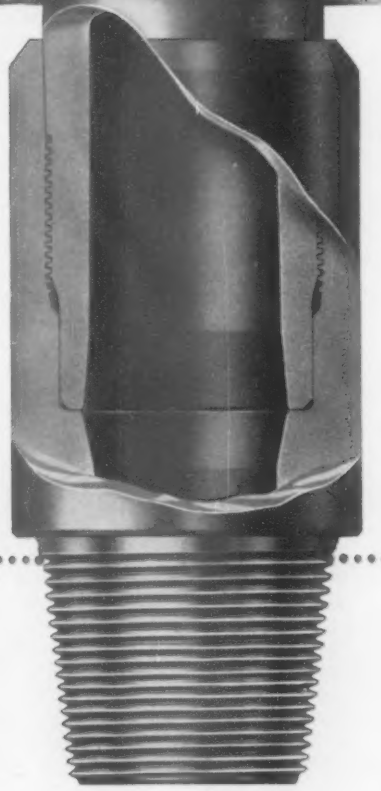

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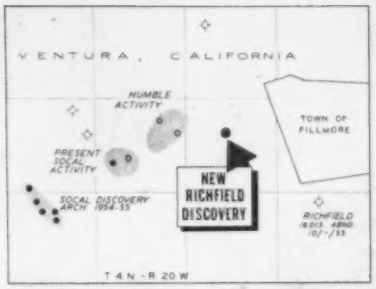
of California and Humble Oil & Refining Co. with production there. Richfield's wildcat is the farthest east in the 2-mile long productive area and is less than ½-mile from the town of Fillmore. Standard's activity is in NW and NE 34-4n-20w and SW 26-4n-20w. Humble's area, where they have five wells on production and two drilling, is in NE 26-4n-20w.

Both Humble and The Texas Co. have leases adjoining Richfield's discovery. Richfield, in addition to its McNab estate acreage, site of the new well, also has more than 800 town-lot leases in Fillmore.

This deep field was discovered by Standard of California in 1954 after a 10-year wildcatting program. Standard alone spent nearly $3,000,000 on five dry holes before finding the Sespe production with 1 Sespe in SW SW 27-4n-20w. This play, which has been marked by frequent and costly dry deep wildcats, now has production in different parts of 4 sections in 4n-20w. The general trend has been for development in a northeasterly direction.



Richfield's eastern extension to deep production in Fillmore field, Ventura County.

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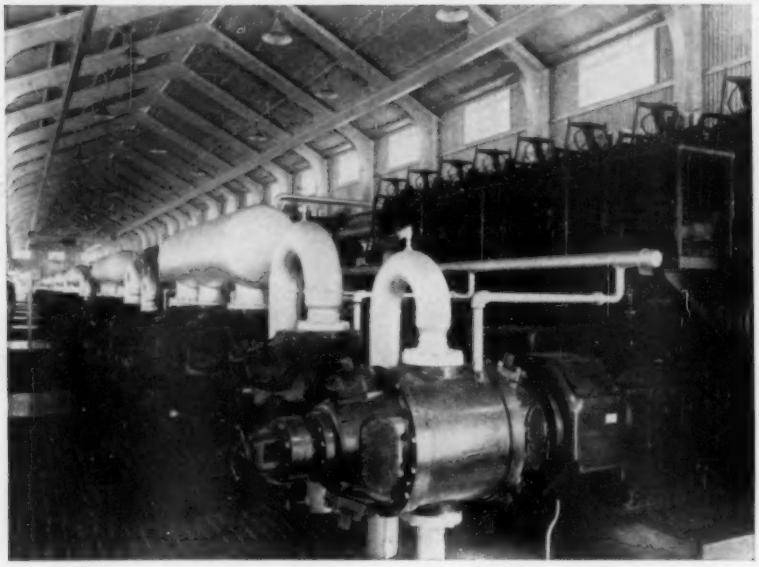

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CANADA

ALBERTA

Two Strikes Added To Growing Virginia Hills

Operators in the Virginia Hills-Whitecourt area of northwestern Alberta, who in recent months proved that it is a highly productive region stretching 90 miles in a southeast-northeast direction, this week added another two strikes to the list. One of those indicated successes is being drilled by Mobil Oil of Canada, Ltd., 8 miles due north of Whitecourt townsite; while the other lies 43 miles north-northeast of it. The Mobil venture indicated wet gas flow rates up to 18,800,000 cu. ft. daily in the Beaverhill Lake strata and as well gave up a good showing of oil on the last test run above the water line. The other test, meanwhile, Home Oil's indicated success lies 25 miles northeast of another recent discovery by the same company, and both indicated oil production in the Slave Point-Mobile Devonian horizon.

The Mobil well, 12-13 Whitecourt, on LSD 13, 12-61-12w5, is 28 miles south-southeast of the Home-Union-H.B. 9-20 Virginia Hills oil discovery well (initial Slave Point zone strike in the area) and 20 miles northeast of the Canadian Fina operated group's wet gas successes in the Windfall area. The Home operated test, meanwhile, is 140 miles northwest of Edmonton city and 43 miles north-northeast of the Mobil discovery hole.

Gas Flows at Waterton Park

Shell Oil Co. is flowing wet-gas at rates up to 9,750,000 cu. ft. daily from the Mississippian formation at its exploratory test in the Waterton Park area of southwestern Alberta. This report, confirmed by Shell, revealed that along with the gas a recovery of 20 bbl. of condensate per million cubic feet of that product is being made. The production tests which are being run are of an open hole section below 11,332 ft. and covers a total of 778 ft. of that zone which was acidized with 15,000 gal. prior to test evaluations.

The well, Shell 1 Waterton, on LSD

4, 21-4-1w5, lies 14 miles southwest of Pincher Creek townsite and is 16 miles west-southwest of the Gulf 1 Walter Marr. Completed gas success in Pincher Creek field.

Phillips-Canada Cities Service Test Blue Ridge Well

Phillips Petroleum Co. and Canada-Cities Service Petroleum Corp. are testing in the Mississippian at their Blue Ridge area wildcat in northwestern Alberta's Whitecourt area.

The well, 9 miles northeast of Whitecourt, recovered 1,800 ft. of clean oil on test of the Mississippian. Other tests indicated two more producing zones in the well . . . the Viking and the Basal Blairmore. Gas was found in the Viking with some oil, and gas flowed up to 1,500 M.c.f. per day on test of the Basal Blairmore at 5,015-5,040 ft. The Viking test was at 4,081-4,151 ft., and the Mississippian test at 5,064-82 ft.

This discovery is 1¼ miles northwest of the first test in this area, a capped Mississippian gas well. The well is called 1 Pleasant "B." It is on Drilling Reservation No. 164, bought by Phillips and Canada Cities Service from Alberta last August for a cash bonus of 100,000 dollars. Location of the discovery is LSD 6, 30-60-10w5.

Normandville Report

Colorado Oil & Gas, Ltd., operator of an exploration and development project in the Normandville region of northwestern Alberta on behalf of itself, Okalta Oils, Ltds., and the Canada Oil Lands group, reported details on two recent oil completions and testing operations at another exploratory venture. The new producers for the team include its 14-20 Normandville Jurassic oil discovery well and the 8-16 Normandville D1 zone of Devonian oil success. The well currently undergoing further tests prior to setting of production casing, 16-9 Normandville was drilled to test the Granite Wash formation and after finding that zone water loaded was plugged back.

At the 14-20 Normandville well, on LSD 14, 20-79-22w5, 5-day production test was recently completed which indicated a potential of 74 bbl. for the well which has a 10-ft. pay sector in the Jurassic. The group's newest D1 zone of Devonian oil completion, 8-16 Normandville, on LSD 8, 16-79-22w5, is presently on 5-day test. Initial tests have yielded oil at the average rate of 60 bbl. per day on pump. This well also yielded a pipe recovery of more than 4,000 ft. of oil during a drill-stem test run in the D3 zone of Devonian.

The other well, 16-9 Normandville, on LSD 16, 9-79-22w5, was drilled to the pre-Cambrian and after failing to yield commercial showings was plugged back to the D1 where tests are currently being run. It is understood that production casing will be set to at least the D1 zone.

SASKATCHEWAN

Mission Canyon Oil at Dalesboro

Imperial Oil, Ltd., has discovered oil in the Mission Canyon sector of the Mississippian formation at a well in the Dalesboro area of southeast Saskatchewan, 11 miles northeast of oil production in Steelman field and 5 miles southeast of Willmar railpoint. It was reported by Imperial that the initial test run in the zone flowed light-gravity oil to the surface and when pipe was pulled a substantial quantity of 34.3°-gravity oil was made. Subsequent tests below the initial one also gave up some oil encouragement.

This strike, Imperial 15-5 Dalesboro, lies on LSD 15, 5-6-3w2, 4½ miles northwest of the Imperial 5-25 Douglaston wildcat abandonment and 3¼ miles east of the Tidewater 6-11 Willmar Crown current exploratory driller.

Oil surfaced in 40 minutes at the discovery and a pipe recovery of 930

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ft. of oil and 30 ft. of mud-cut oil was made. There was no evidence of formation water.

QUEBEC

At 2 Bald Mountain on the Gaspe Peninsula, the hole has apparently again bridged at 6,600 ft., and is being drilled through.

At 1 North Shore, 12/10 miles south of the village of Batiscan, the cement has set and drilling is being resumed from 2,140 ft.

At 2 North Shore, 2 miles south of Berthier, 8-in. casing was run and cemented down to 1,360 ft.

At 3 North Shore, 2 miles south of Portneuf, the well is drilling below 1,050 ft.

ILLINOIS BASIN

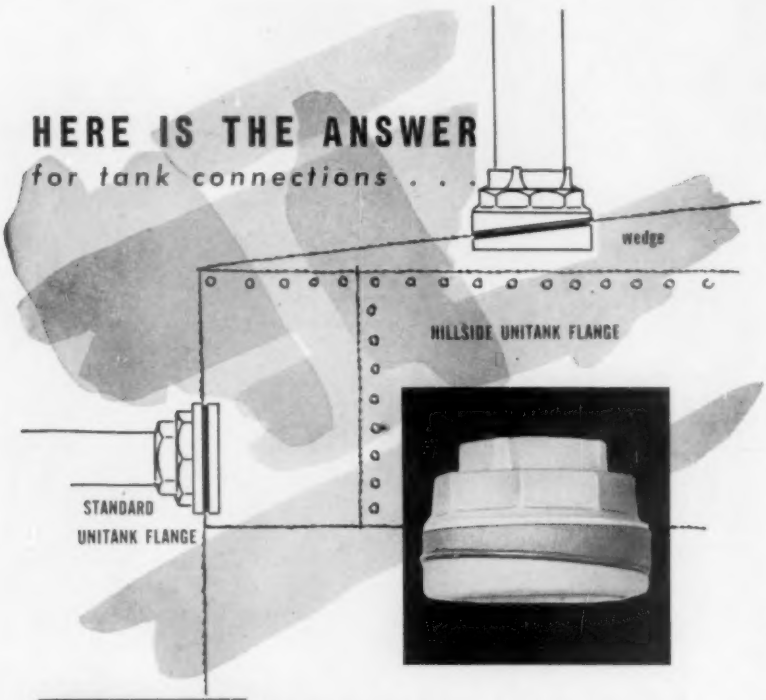
ILLINOIS

Three Oil Fields, One Gas Discovered in February

Three new oil fields and one new gas field were discovered in Illinois in February, according to State Geological Survey Division of the Department of Registration and Education. The new gas field, Beverly in Adams County, produces from the Devonian-Silurian and is about 5 miles northwest of the Fishhook gas pool which produces from the Silurian. Both fields are shut in. The new Turkey Bend oil pool, in Perry County, produces from the Trenton. It is more than 15 miles south of the nearest Trenton production. Corinth North, in Williamson County, produces from the Aux Vases sandstone in an area characterized by Aux Vases production. The fourth new pool, Grayson in Saline County, produces from the Cypress sandstone and McClosky limestone about 2 miles south of the Eldorado Consolidated pool.

Drilling was below normal in February. Only 167 wells were completed in the 4-week period, as compared with 191 for the same 4 weeks in 1956. The upward trend in drilling which continued throughout most of 1954, 1955, and 1956, has been reversed, at least temporarily. Drilling in the Cooks Mills-Bourbon area has been virtually completed, and there is no new area of concentrated development. No county had more than a dozen wells completed in February, and none of the new pools appeared promising.

Estimated production for February is 6,519,000 bbl., or 233,000 bbl. daily. There has been no drop in production corresponding to the decrease in drilling. Increased secondary recovery oil production has more than compensated for the decrease in new drilling and normal decline in production of older wells.



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Call, write or wire ENARDO for further information.

ENARDO manufacturing company
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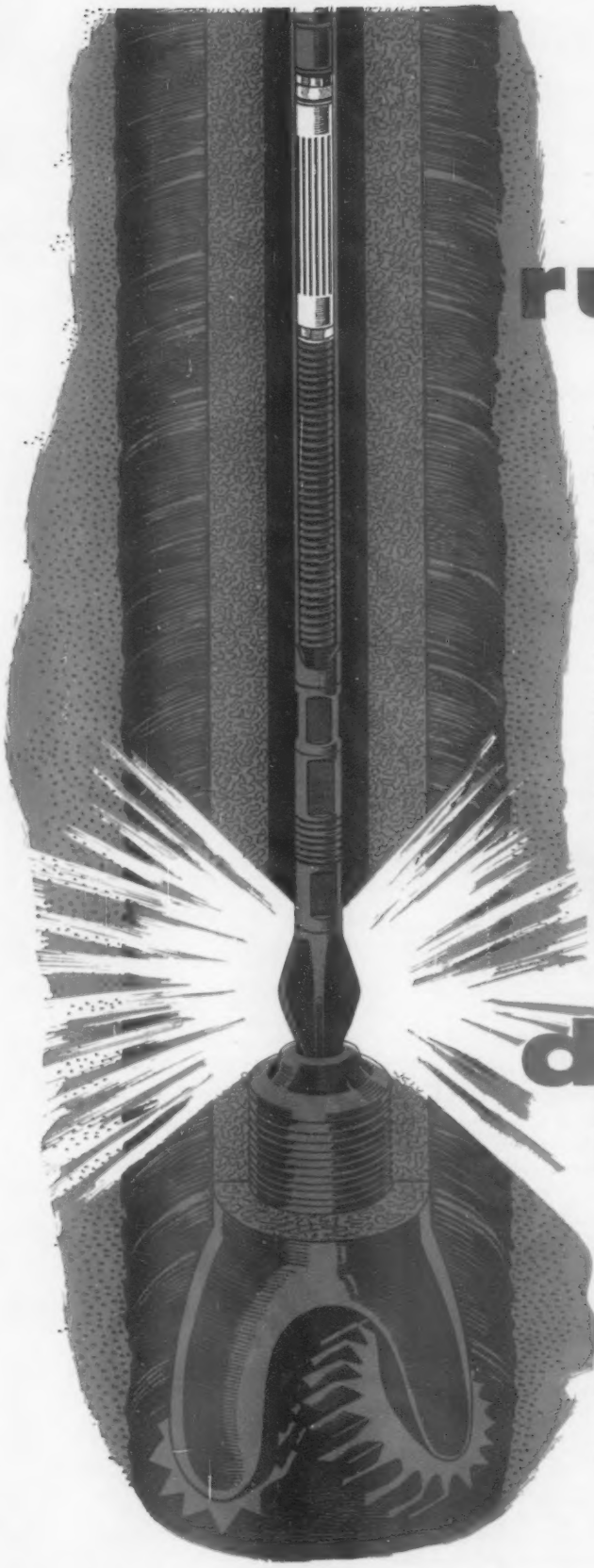
MICHIGAN

New Mid-Salina gas-oil well in Dorr pool, Allegan County, will be produced first to supply gas, at a rate of about 200,000 cu. ft. a day, and secondly for what oil it will flow in the course of meeting this gas requirement.

Louis Zellman, developer of this new pay in Dorr field, at his 4 B. Zellman, NW SE NE 25-4n-13w, Salem Township, has contracted to furnish about 6,000,000 cu. ft. of gas a month to the REA generating plant at Burnips, Mich., about 3½ miles west and north of this new producer. A 3-in. gas line will be constructed by Zellman.

Little new information about well's potential was gained last week. Testing was delayed until high-pressure wellhead equipment and gas separator was installed. First semiextended test was to be run this week. Well will be tested for 6 hours.

Only new test of consequence was



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a 30-minute flow through a ¼-in. choke. Mercury was blown for gage used test gas flow, but well was estimated to be producing at the rate of 200,000 cu. ft. of gas a day on this test. Well flowed 5.85 bbl. of crude at this choke arrangement, about half the amount fluid contained in the full length of tubing in the well. Casing pressure at beginning of this test was checked at 1,040 psi.; at 890 psi. at conclusion of test.

New Mid-Salina pay was perforated with 60 shots at 2,754-58 ft. after a bridge plug was set at 2,800 ft. A 4,000-gal. acid treatment materially boosted natural production of 45,000 to 70,000 cu. ft. of gas and about 3 bbl. of oil a day.

This is the third Traverse oil pool in southwestern Michigan below which successful deeper zone gas and oil wells have been completed. The Taggart Co. has completed 10 Mid-Salina gas wells (out of 10 drilled) below the Overisel field, and one small oil-gas well was completed in the Hopkins pool by Ford Oil Co., Oil Producers, Inc., and the Carter Oil Co. As a consequence, a small quiet leasing boom is now under way in southwestern Michigan.

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NEW MEXICO

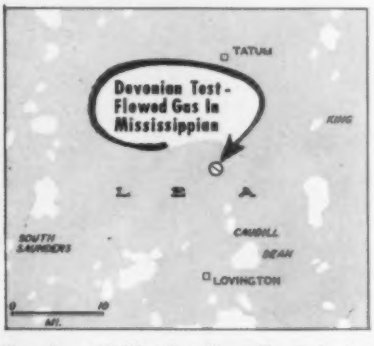
SOUTHEAST NEW MEXICO

Lea County Wildcat Flows Mississippian Gas

Phillips Petroleum Co. 1 Austin, a 14,500-ft. Devonian wildcat south of Tatum in central Lea County, reported a good flow of gas while drill-stem testing in the Mississippian.

On the test at 13,195-13,305 ft., the 3,630-ft. water cushion flowed into pits for 20 minutes. Operators then reduced top choke to ⅜-in. and turned it into tanks. Gas volume, with no oil or distillate, was at the rate of 1,541 M.c.f. per day. Flowing tubing pressure was 1,400 psi. Recovery in the pipe was 600 ft. of 49°-gravity oil, plus gas-cut drilling mud. Bottom-hole flowing pressure reached a maximum of 2,310 psi., and 17-minute shut-in pressure 5,315 psi. Drilling continued.

Location is SW SW 17-14s-36e, 4½ miles north and slightly west of production in Caudill field.



Map shows Phillips Petroleum Co. 1 Austin, Devonian wildcat in central Lea County. Drilling continued after the well made a flow of gas from the Mississippian.

New Location for Deep Test in Hot Area

Humble Oil & Refining Co. made location for another test in the area 15 miles west of the town of Lovington. The project will be 1-AU State, SE SE 4-16s-23e. Projected depth is 12,800 ft.

Location is approximately 1½ miles southwest of Humble's 1-AQ State, recent Pennsylvanian discovery at 10,960 ft.

Seaman field extended . . . Sinclair Oil & Gas Co. has completed the third well in the Seaman field of western Lea County at its 3 Seaman Unit, NE SE 24-16s-33e. The location is an extension to the south.

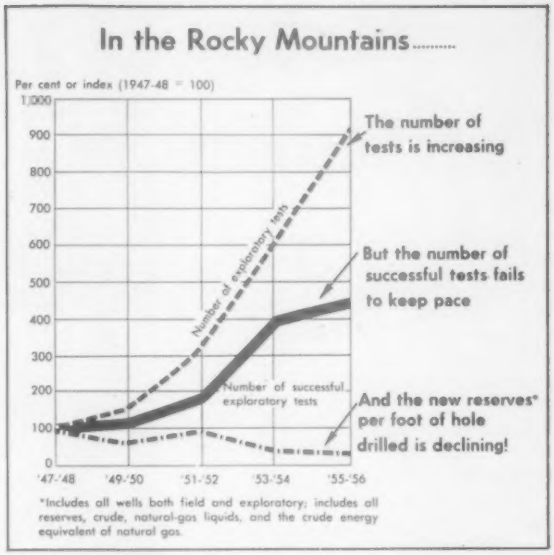
Potential was 762 bbl. a day, based on a flow of 168 bbl. in 6 hours

(Continued on page 217)

Rockies Dominate Exploration Spotlight

. . . Each year a new basin comes to the forefront

by Norman S. Morrisey
Drilling-Development Editor



THIS CHART shows the current trend in Rocky Mountain exploration.

THE Rocky Mountains beckon oil finders with the promise of large reserves and many virtually untapped basins. In the last 10 years, the number of exploratory tests drilled each year has increased nine times. And the results have justified the effort. Three major oil basins have been uncovered since 1951 — Williston, Denver, and Paradox.

New crude found each year has climbed from a low of 31 million barrels in 1949 to a peak of nearly 500 million in 1956. Opportunities for finding new oil are excellent. Probably the word "new" best describes exploration in the Rocky Mountains. Each year a new basin dominates the exploration scene. Each year, new pay zones come to the forefront. During the boom days at Rangely it was the Tensleep. In 1951 it was the Madison. In 1954 it was the Dakota sands in the Denver basin. In 1956 the Paradox production at Aneth and the lower Gallup production at Bisti shifted the exploration spotlight to the Four Corners area. And this part of the Rockies will dominate the 1957 drilling and exploration picture.

Drilling results . . . Although large reserves can be expected in the Rockies, the return on drilling has declined since 1947 and 1948. These peak years have never been surpassed if reserves are figured in terms of barrels of new reserves found per foot of hole drilled. However, the Rockies is a young oil province when compared with other parts of the country. Notice on the chart that the 1951-52 reserve figures reversed the downward trend of the curve. The results in 1957 could easily reverse this trend again, because the rapidly accelerating drilling program in the Four Corners area could block out 500 million barrels of new reserves.

Scene changing . . . Prior to World War II, exploration in the Rocky Mountains was guided almost entirely by surface geology. And this concept carried over for several years after the war. However, in this period, geophysical work became increasingly important. But the main emphasis was still on structure. Today, however, the structural phase is becoming less important and stratigraphy is dominating the exploration picture.

The 1956 results show how important a role stratigraphy can play in trapping oil. Bisti is a large trap discovered in an area where oil from Cretaceous sands was not important. The successful completion from the lower Gallup sand at Bisti have completely altered this concept. Today oil companies are actively seeking Cretaceous oil in an area that was once considered only for its gas potential.

The Aneth trend in southeastern Utah is another good example of how stratigraphic thinking helps find oil. The Pardox basin had yielded no oil of significance prior to 1956. There were large known anticlines in the basin. Some of them stretching for many miles. But they would not produce significant quantities of oil. Careful study of the Paradox basin showed that the porous zones occurred along the southwestern edge of the basin. The large known anticlines were poorly located with respect to potential reservoir beds in the Paradox formation.

The most favorable areas for oil accumulation lay to the southwest. The wisdom of this thinking is apparent from the spectacular discoveries of 1956. And these new reserves will be blocked out quickly with the assurance of two pipelines capable of handling 110,000 bbl. of oil daily.

Wyoming has temporarily taken a back seat to the newer areas, but oil finders have not been idle. Geologists are reevaluating many of the large anticlines in the terms of both stratigraphy and structure. In recent years, the Curtis sand has been found productive on the flanks of several anticlines in the Big Horn basin of Wyoming. Sinclair Oil & Gas Co. recently found Tensleep production at East Salt Creek field. Currently, True Oil Co. is attempting to complete a deep test in Donkey Creek field in Crook County of northeastern Wyoming. The test is a tight hole, but unconfirmed reports are that the well logged shows of oil in the Minnelusa (Pennsylvanian).

What is the outlook . . . The future for the Rockies can only be described as bright. It is still a young oil province. There are many promising areas that need only one key discovery to touch off an active drilling campaign. The Disturbed belt in Montana is a good example. Several large oil or gas fields have been found on this trend in Canada. But the drilling results in Montana have been disheartening to date.

Each year geologists are finding new pay zones that become important oil reservoirs overnight. The trend toward stratigraphic thinking will continue to uncover these pay zones.

New pipeline outlets are contributing their share toward accelerating the exploration and drilling program.

The Rocky Mountain states combine to form one of the last oil frontiers in in the United States. Drilling results are well above the national average when figured in terms of new reserves found per foot of hole drilled. This trend should continue for several years.

New Machine Plots Sections

CROSS-SECTIONS or maps are made from punch cards or tape by this new plotter.

A HIGH-SPEED machine which automatically plots seismic cross-sections from punch cards and tape has been introduced to the oil industry.

The plotter operates as one arm of a computing system. It can plot any information for which an X-Y coordinate location has been established. And it translates the computer's huge digital output into more easily interpreted form.

The machine is manufactured by Benson-Lehner Corp. of Los Angeles. It is the first plotter designed specifically to present digital information in chart form. Advantages of digital over analog techniques include:

. . . **Ease of mathematical** manipulation with conventional tools such as electronic computers.

. . . **Greater accuracy** in processing data.

The variety of symbols, numbers, and types and lengths of lines which the printing head can plot—at speeds about 25 times faster than manual methods—indicates its use for plotting:

. . . **Gravimetric and magnetic information.**

. . . **Geological cross-sections.**

. . . **Subsurface and surface maps.**

The plotter can also be operated directly from an oscillograph reader for quick-look editing of seismic data.

In seismic cross-sections, reflections are plotted as one of four types of lines. The lines indicate the quality of the reflections. The angle at which they are printed corresponds to the apparent dip angle of the reflected strata. Shot point and shot time are indicated by six decimal digits at the center of each line.

Seismic tool . . . The primary purpose of the plotter is to act as an output device for a computing system.

This makes it possible to use computing techniques for analyzing seismic information. The finished display not only can include corrections for migration, normal moveout, etc., but can also correct for nonlinear functions and situations where the constant-velocity horizons are not parallel with the surface.

Where the raw seismic data have been recorded on oscillographs, automatic processing can begin with an oscillograph analyzer and recorder.

In this step, reflection time and time-difference recordings of analog output are fed to a digital conversion unit. Output can then go to various digital-tabulating devices such as an electric typewriter, card punch, or paper-tape punch.

Other information such as shot point, shot time, and quality of reflections is either recorded by selector switches or by a manually operated keyboard. Total time for the entire operation is about 5 seconds.

How it works . . . The plotter charts each step in less than 1 second. Basically, here is what happens:

In the control unit, the information is sorted into channels X, Y, or O (dip angle). When the material is fed in by punched tape, the unit sorts the information into the different channels in the same sequence as the computer format. Selections from card input are made at the computer summary punch plugboard. The control unit also selects the plot origin and scale factors. Various control commands such as "start read," "stop read," and "plot," are also supplied.

Input to the control unit is in a form compatible with the output of most modern computers. Information for the X and Y coordinates and dip angle (O) is automatically interpreted and presented to the various control circuits.

Storage of information is carried out by a two-stage technique. The information is first passed into a buffer section. When it is ready to move to the next point, it is transferred to the main store.

The plotting mechanism is then positioned in X, Y, and O orientation by voltage servo systems, controlled from the main storage circuit by digital-to-analog converters. The printing head is set up directly from the store of information simultaneously with the positioning of the servo systems.

Pin points horizons . . . The printing head, when adapted for seismic work, prints four types of lines—heavy, light, dashed, and dotted—to indicate the quality of the reflection.

Each type of line is printed in three lengths to indicate whether the reflection was from a horizon less than 1,000 ft., between 1,000 and 2,000 ft., or greater than 2,000 ft.

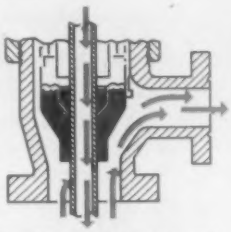
Reflection time and shot points can be indicated by six decimal digits printed at the center of each line. A symbol indicates the specific X-Y coordinate location of the shot point.

A 40 by 40-in. area is available for plotting the cross-sections. Use of roll paper permits much longer migrations (X plotting dimension) to be made.

The flexibility of being able to select only the numeric part of the printed line makes the plotter easily adaptable for plotting gravimeter and magnetic data. Basic values such as elevation corrections and second derivatives could be plotted and then contoured in by hand.

Manufacturers of the plotter believe the machine will also be used for geological mapping and for interpreting horizons from seismic and structural geological data. Information from well logs and dip-meter surveys can also be evaluated better with computation and plotting techniques.

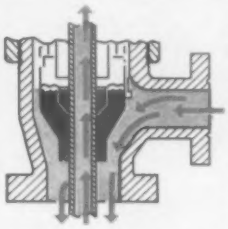
DRILLING WITH AIR OR GAS?



There is a steadily growing use of air or natural gas to replace the mud column in many drilling operations. Advantages include faster drilling rates, more footage per bit, no "lost circulation" problems, and greater production recovery.

The ideal unit for sealing off around the drill string and maintaining safe pressure control is the Shaffer Combination Rotating Blowout Preventer and Stripper. It not only permits the well to be drilled safely, but also it can be adapted to be used as a casing stripper during casing operations to maintain pressure control.

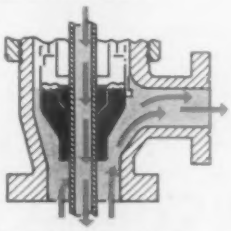
DRILLING WITH REVERSE CIRCULATION?



Reverse circulation is another of the modern drilling techniques that have definite advantages in certain types of formations. By returning the cuttings through the inside of the drill string, higher return velocities are obtained at lower pump pressures (and lower pressures on the formations). The higher velocities insure larger cuttings being returned from the formations, in many cases eliminating need for coring and thus saving rig time. Also by carrying large cuttings away faster, bit life is lengthened and drilling time is reduced.

These and other advantages make Reverse Circulation techniques worth investigating — and here again, the key to proper operation is a Shaffer Combination Rotating Blowout Preventer and Stripper to seal off the drill string and to control circulation pressure while drilling.

NORMAL DRILLING OPERATIONS?



Here again, this Preventer and Stripper insures safety and efficiency to a degree unmatched by any other type of hook-up. The unit seals off around the varying diameters of the drill string — pipe, couplings, tool joints and drill collars — adjusting itself **automatically** to the various diameters and shapes. It even seals safely around such shapes as square, hexagon or octagon kellys. And the seal is automatically maintained as long as the drill string is in the hole. No valves to operate, no levers to move — nothing to remember or forget when pressure emergencies threaten.

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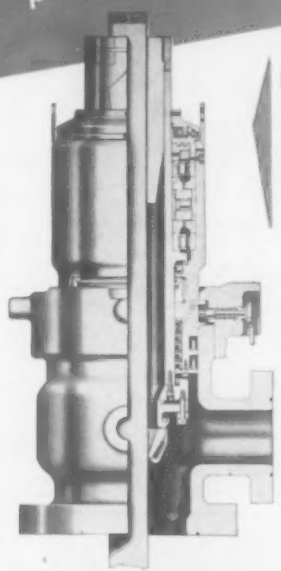

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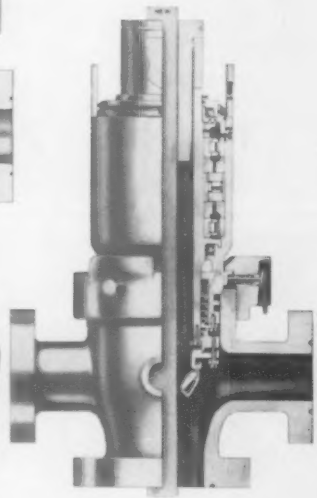

USE THE TYPE 51

for blowout protection in slim hole drilling, drilling-in, production jobs, reworking of wells and similar applications.

Shaffer Combination Rotating Blowout Preventers and Strippers are known throughout the industry for the unequalled *automatic* protection they provide against pressure emergencies. Nothing to remember—or forget—when pressure emergencies threaten, because this equipment automatically seals off around the drill string as the tools are lowered into the well . . . *and maintains this pressure-tight seal—without attention—throughout all subsequent drilling operations.*

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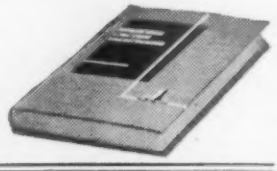

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By L. U. de SITTER

Professor of Geology, Geological Institute of University of Leiden, Holland

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(Continued from page 212)

through 23/64-in. choke. Perforatings were in the upper Pennsylvanian limestone at 10,706-20 and 10,740-52 ft. Tubing pressure was 520 psi., gas-oil ratio 547:1 and gravity 37.8°.

NORTHWEST NEW MEXICO

Gallup Discovery In San Juan Swabs

Lion Oil Co. swabbed oil at the rate of 5 bbl. per hour from the Gallup sand at 5,362-82 and 5,394-5,412 ft. at a new indicated discovery in the San Juan basin.

The 1 Atlas, SE NW SE 34-25n-10w, San Juan County, is 3½ miles northwest of a 1956 discovery at Forest Oil Corp. 1 Federal in C NE NE 13-25n-10w. That well made 120 bbl. of oil per day. Lion is now installing pump equipment at its discovery.

Other 1956 Gallup discoveries lie northwest of this new pool prospect. Anderson-Prichard Oil Corp. 1 Begay and the 1 heirs of Ko-Sa.

NEVADA

Activity in Nevada last week was highlighted by another abandonment in the Las Vegas region. Matador Oil Co. abandoned 1A located 15 miles southeast of Las Vegas in Clark County after swabbing water in the 1,465 ft. wildcat. Matador was drilling ahead on 29-1X below 100 ft. This site is 13 miles southwest of Las Vegas.

Moapa Oil & Gas Co. was drilling below 600 ft. on another Clark County wildcat in the West Logandale region 24 miles from the Utah border.

OKLAHOMA

OKLAHOMA

Wildcat Success Shows Promising Development

Although total well completions in Oklahoma continue to lag behind 1956 figures, new discoveries in nearly every section of the state brighten the outlook considerably.

South . . . The Texas Co. has opened a prolific Ordovician reservoir at East Marietta in Love County.

The 1 Westheimer, NW SW NW 17-7s-3e, flowed 6 bbl. of high-gravity distillate per hour from the Oil Creek sand at 8,746-56 ft.

Anderson-Prichard Oil Corp. has a Bromide-Ordovician sand discovery at 1 Timms in NE NE 9-7n-3w, McClain County. Perforations at 10,422-32 ft.

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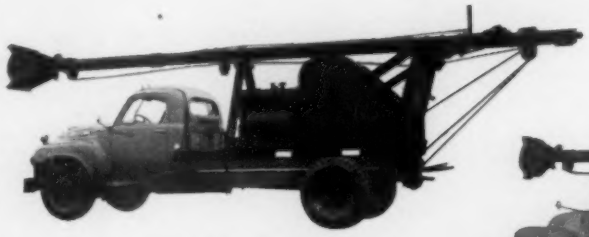

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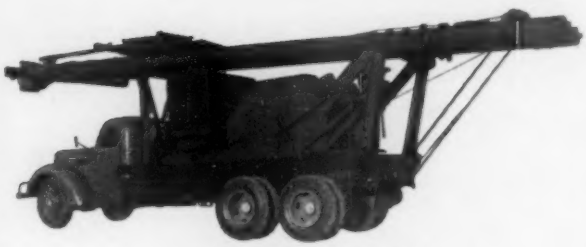

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flowed oil in 45 minutes from a 35-ft. pay zone. This discovery is near Washington.

A deepened well at Lindsay, Carter Oil Co. 1 Lacy, SE SE 32-5n-3w, flowed 190 bbl. of distillate and 47,000 M.c.f. of gas per day from the Oil Creek sand at 10,742 ft.

Southeast . . . Stephens Production Co. reworked 2 Bryant in NW NW NE 24-10n-25e, Sequoyah County, coming up with a good basal Atoka-Pennsylvanian gas well at 5,972-6,004 ft. Flow was 3,000 M.c.f. per day. Shallow production nearby is at 2,000 ft.

Panhandle . . . One of the Oklahoma Panhandle's most important discoveries in some time is Phillips Petroleum Co.'s 1 Blakemore in SW NE 36-4n-20eCM, on the west side of Beaver County.

This well flowed 500 bbl. of oil per day from perforations in the Chester-Mississippian sand at 6,542-63 ft. to establish first oil production from Mississippian sand in the Panhandle. Other production is in the Chester lime.

Panhandle Eastern Pipeline Co. got prolific Toronto - Pennsylvanian gas production at its deep well in Texas County, inside Hugoton field. The well flowed 35,000 M.c.f. per day.

Northwest . . . Harper County interest centers at Eason Oil Co. and Wilcox Oil Co.'s Southeast Stockholm field area. The 1 Crawford in SW NE 17-26n-24w, flowed gas from the Tonkawa sand at rate of 8,500 M.c.f. per day from perforations at 5,423-60 ft.

In Woodward County Union Oil Co. of California has an indicated Hunton lime new pay discovery for Southeast Woodward field, the county's sole producing area. The 1 Sherman, SE SE NW 13-22n-20w, flowed gas and distillate from the deep Hunton at 10,287-10,312 ft.

North . . . One of the best Cherokee sand - Pennsylvanian discoveries since opening of the famed trend through Alfalfa and Grant County's northern tier was completed at Davon Drilling Co. 1 Ginder, NE NW 30-27n-10w, near Cherokee. The rank discovery flowed more than 400 bbl. of oil per day from perforations in the Cherokee sand at 5,174-84 ft. This well lies considerably south of the west-east trend that developed in this area last year.

NORTHWEST OKLAHOMA

Morrow Discovery East Of Southeast Stockholm

A new Morrow gas pool was opened east of recently opened Southeast Stockholm field in Harper County. The discovery well is Woods Petroleum Co. 1 Randall, C NE NE 29-26n-22w.

A drill-stem test in the Morrow sand at 6,704-17 ft. made 5,000 M.c.f. at the end of 5 minutes . . . then increasing to 6,500 M.c.f. after 10 minutes. Recovery included 10 ft. distillate.

The operator is digging on down to the Chester-Mississippian at 6,737 ft.

Southeast Stockholm . . . In this field, Eason Oil Co. and Wilcox Oil Co. are taking production tests at 1 Price-Palmer in C NW NW 28-26n-23w, southwest of the field discovery well, and at the 1 Crawford in C SW NE 17-26n-23w, northwest of the above well.

The Price-Palmer flowed 15 bbl. of oil in 30 minutes on 36/64-in. choke from perforations in the lower Tonkawa at 5,532-36 ft. The Crawford is testing gas and distillate at 5,425-28 and 5,442-49 ft.

CENTRAL OKLAHOMA

New Pay Reported at Southwest Lacy Field

A field in northwestern Kingfisher County, Southwest Lacy, has a new pay zone, the Marshall. The discovery

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SLUSH PUMPS

well is Utah Southern Oil Co. 1 Hill, C NE SW 3-18n-9w.

The well flowed an estimated 20,000 M.c.f. of gas per day with considerable distillate on test at 9,140-58 ft.

ROCKY MOUNTAIN

COLORADO

Buck Peak Discovery Completed in Moffat

A new oil field was opened in Moffat County, northwestern Colorado. The discovery well is Malco Refineries 2 Kowach, C SE NW 25-6n-90w, in the Buck Peak area.

The well flowed 200 bbl. of 39°-gravity oil per day from open hole in the Tow Creek and Niobrara.

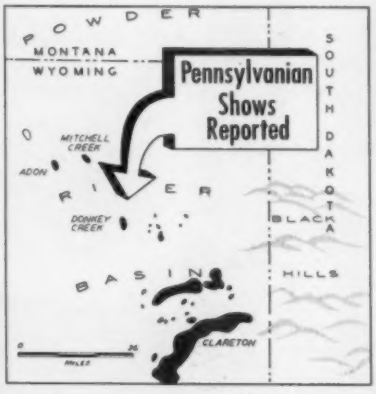
This is the second strike in the Buck Peak area. The other discovery, 1 Kowach, SE NW NW 25-6n-90w, is a Skinarump producer. Buck Peak is situated 7 miles southeast of Craig, Colo.

UTAH

Oil Recovered on Test At Continental Wildcat

Continental Oil Co. reported recovery of 500 ft. free oil on a drill-stem test in the Paradox-Pennsylvanian at its 1 Navajo "H" wildcat in C SW SE 21-40s-25e, San Juan County.

This Paradox basin test is 3 miles east of Aneth and 5½ miles west of



Pennsylvanian-Minnelusa shows were reported at True Oil Co. B-6 Burrows in Donkey Creek field on the northeast side of the Powder River Basin in Crook County, northeastern Wyoming. This well is the first to penetrate the pre-Cretaceous rocks in this area. There has been little deep drilling done in this section of the basin. There are two pre-Cretaceous producers in the entire northeast part of the basin . . . Adon and Mitchell Creek. The Minnelusa is the main pay at Lance Creek far to the south in the basin.

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East Aneth. The test was made at 5,780-5,854 ft. Coring is at 5,981 ft. The important link test is separated by dry holes from both Aneth and East Aneth fields.

Logs Run at Featherstone Prospect in San Juan

Logs were run at the Featherstone discovery in NW SW SW 24-40s-22e, San Juan County. This important apparent Pan American Petroleum Corp. discovery in the Paradox basin is 3 miles west of Recapture Creek field. A drill-stem test at 5,402-54 ft. flowed oil at the rate of 6 bbl. hourly. Other tests have had no shows.

The 1 Featherstone is 2½ miles northwest of North Desert Creek field. Success would move the Aneth trend 3 miles farther west.

WYOMING

Carbon County Diamond Ranch Discovery Finaled

The 1 Diamond Ranch Unit discovery in Carbon County was completed for 384 bbl. of oil per day, cut 1 per cent water. Ohio Oil Co.'s discovery is a Lakota producer at 5,377-5,426 ft.

This is the first test of the Diamond Ranch Unit. Location is 2 miles northeast of Rock Creek field. The discovery already has an apparent confirmation, the 2 Unit in NE NW NW 25-20n-78w. Oil was recovered from both the Lakota and the Muddy.

Cambrian Gas Flows at Oregon Basin Deep Test

A deep wildcat test in Oregon basin, Park County, flowed gas at the rate of 3,271 M.c.f. per day on drill-stem test of the Gros Ventre-Cambrian. The discovery well is Ohio Oil Co. 22 Samuel, C SW NW 32-51n-100w. The well is a deepened Madison producer.

Tensleep No. 4 Finaled At East Salt Creek

The fourth Tensleep oil well was completed in East Salt Creek field, Natrona County. The newest prolific oil well from this formation is Sinclair Oil & Gas Co. 2 Government-D, NW SW NW 10-40n-78w.

The well had a calculated potential of 1,488 bbl. per day from perforations at 7,472-7,514 ft. Tensleep production was added to this Wall Creek and Lakota field last year at 8 Government in SE NW SW 10-40n-78w.

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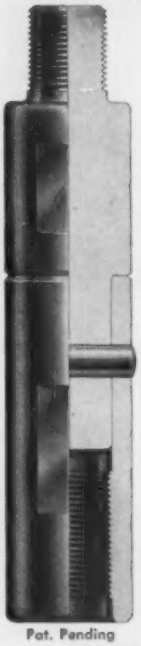

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WEST TEXAS

Devonian Oil Flow in Keystone South Field

Gulf Oil Corp. 181 Keystone Cattle Co., located on the northwest flank of Keystone South field, Winkler County, reported a heavy flow of oil from the Devonian. Regular pay for Keystone, South field is the Tubb, of Lower Permian age.

Gulf's well was drilled to 9,991 ft., plugged back to 8,770 ft. and the Devonian perforated from 8,640-80 ft. After swabbing on perforations for 3 hours the well kicked off and flowed 243 bbl. of new oil and 5 bbl. of water in 7 hours on ½-in. choke.

Location is in SW SW Section 29, Block B-2, PSL Survey, 6 miles northeast of Kermit.

Waddell discovery completed . . . Humble Oil & Refining Co. 1 Corneil Hogg, Waddell discovery east of the Weiner area of Winkler County, and 10 miles southeast of Kermit, flowed 193½ bbl. of 41° oil on final tests.

Production was through ½-in. choke from perforations at 11,704-50 ft. Gas oil ratio was 760:1 and tubing pressure was 35 psi. Total depth was 12,172 ft., plugged back to 11,800 ft.

Requested new field name is Kermit, Southeast (Waddell).

Skelly Oil Co. 1 Freeman was shut down after testing sulfur water on latest test at 12,063-12,203 ft. Projected depth was 13,000 ft. A section higher up the hole developed oil on drill-stem tests.

Dawson County Has Pennsylvanian Shows

Skelly Oil Co. 1 Frank Freeman, deep wildcat in southwestern Dawson County, reported free oil on a drill-stem test in a lower Pennsylvanian zone at 11,151-74 ft. The tool was open 3 hours. Gas surfaced in 30 minutes and recovery was 560 ft. of 56° oil, 2,000 ft. of oil and gas-cut water blanket and 60 ft. of oil and gas-cut mud. Bottom-hole flowing pressure ranged from 985-740 psi., and 15-minute shut-in pressure reached 3,920 ft.

Lowest formation marker reported was the Strawn at 10,680 ft., by samples, on elevation of 2,988 ft.

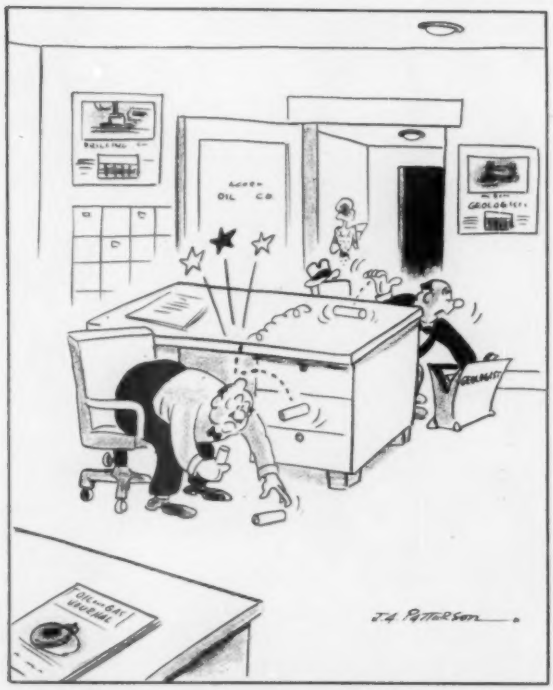
Location is a relatively unexplored portion of the county. Nearest production is in the Lindsley-Strawn field, 6½ miles to the northwest. No. 1 Freeman is in Labor 11, League 275, Glasscock CSL Survey, 9 miles southwest of Lamesa.

Delaware Basin Test Moves Off Rotary

Shell Oil Co. apparently was all through drilling at its deep Delaware basin test in southwestern Winkler County. The firm's 1-17-A University, southwest of Wink, moved off rotary and was shut in for storage after making flow tests in a Permian zone.

One flow test gaged 45 bbl. of 41° oil with no water, in 10 hours, through

THE OIL AND GAS JOURNAL



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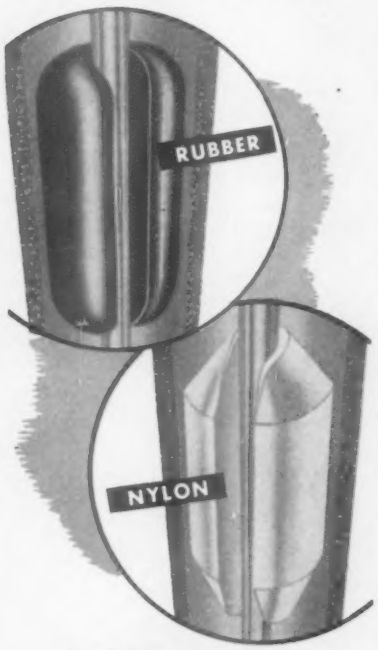

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½-in. choke, from perforations at 11,930-70 ft.

Motley County . . . This county's only bid for oil production is testing on Wolfcamp perforations at 4,187-93 ft., recovering some new oil.

The project is Pan American Oil Co. 1 Fred Brandon, 7-C4-WTRR Survey, 6 miles east of Roaring Springs. After washing the above holes the well swabbed 20 bbl. of load oil and 12 bbl. of new oil in 12 hours. Previous tests found oil and salt water at 4,178-4,203 ft., and free oil with no water from 4,157-78 ft.

WASHINGTON

Shell Oil Co. has abandoned 1 Bonnell at 5,980 ft. in the Tenino area 25 miles south of Olympia in Washington. This was Washington's first wildcat this year. The decision to quit the test was made after electric and radio activity logs were run to the bottom.

Successful Wildcats

ALBERTA

Canadian Exploration Gas 7-18 Schuler, LSD 7, 18-16-1w4. TD 1,830 ft. Bow Island gas well.

BRITISH COLUMBIA

Gulf States 1 Prophet River Unsurvey Territory. TD 6,969 ft. gas well.

SOUTH LOUISIANA

Jefferson Davis Parish: H. L. Hawkins 1 Atkinson, 19-11s-5w. Shut-in gas-condensate well, no gage, perfs. 11,246-50 ft. TD 11,651 ft. (New pay and extension in Hayes field.)

Plaquemines Parish: Bateman Driling Co. 2 Mark Delesdernier et al, 35-22s-31e. IP 3,000 M.c.f. daily, 15/64-in., 10 BC per 1,000 M.c.f., 51°, perfs. 6,082-94 ft. TD 9,002 ft. (New field—"Head of Passes" area.)

PENNSYLVANIA

Jefferson County, Gaskill Township: Columbian Carbon Co. 2-1838 Harriett C. Mcclure, 400,000 cu. ft. gas after fracturing. Onondaga 7,372 ft., chert 7,392-7,410 ft., gas. TD 7,604 ft.

SASKATCHEWAN

Shell South A7-20 Viewfield, LSD 7, 20-6-9w2. TD 4,630 Charles oil well.

NORTH TEXAS

Cooke County: Felderhoff Brothers Drilling Co. 1 Evans, J. M. Stevens Sur., A-1441, University Lge. 7, Blk. 6, 2 miles SW Callisburg. IP 75 BOPD, ⅞-in., TP 40 psi., GOR 400, 48°, pay 2,680 ft. TD 2,686 ft.

Jack County: Midland Oil Corp. 1 Rosa-Jones, Blk. 3, Harrison Young CSL, A-915, 4 miles S Newport. IP 485 BOPD, 20/64-in., TP 550 psi.. GOR 980, 42°, Caddo conglomerate 5,829-39 ft. TD 5,930 ft. New field name, Catlin-Caddo.

Young County: American Petrofina, Inc. 1 Daily, Sec. 167, TE&L Sur., 4 miles SW Olney. IP 143 bbl. oil in 14 hours, 10/64-in., TP 650 psi., 44°, Mississippian 4,893 ft. TD 4,907 ft. Suggested new field name, Daily-Miss.

Cox & Campbell 1 Vogtsberger, TE&L Sur. 239, A-486, 1 mile NE Olney. IPP 18 BOPD, 38°, GOR zero, pay 1,017 ft. TD 1,023 ft.

Young County: Bobby M. Burns 1 Choat-Leberman Unit, TE&L Sur. 259, A-506, 5 mi. NE Newcastle. IP 144 BOPD, 6/64-in., TP 775 psi., 43°, GOR 521, Mississippian 4,800-15 ft. TD 4,829 ft. Suggested new field name, True (Miss.)

Turner & West 1 Deats-Kay, Sec. 8, W. Cornett Sur., A-1890, 5 mi. SW Graham. IPP 73½ BOPD, 42°, GOR 350, Caddo 4,336-43 ft. TD 4,356 ft.

WEST TEXAS

Crane County: Gulf Oil Corp. 1-1 Henderson, 5-B23-PSL, 7 mi. S Jenkins. IPP 136 BOPD 41°, GOR 309, Pennsylvanian 7,345-7,420 ft. TD 10,115 ft., PB 7,500 ft.

Irion County: Murray Petroleum Co. 1-B Noelke, Sec. 2, M. Chamberlain Sur., 12 mi. W Mertzon. IP 144 BOPD, 16/64-in, TP 440 psi., GOR 300, 40°, Leonard perforations 5,047-49, 5,063-67 ft. TD 7,649 ft.

Lamb County: Delfern Oil Co. 1 Young, Labor 8, League 684, State Capitol Lands Sur., 5 mi. SW Littlefield. IP 170 BOPD, 24/64-in., TP 125 psi., GOR 1920, 27°, San Andres 4,116-31 ft. TD 4,131 ft.

Pecos County: Southland Royalty Co. 1 Lilly Anna, 11-3-H&TC, 1 mile N Imperial. IP 13,800 M.c.f. gas, calculated open flow, Tubb perforations 4,816-62, 4,874-88 ft. TD 6,185 ft. Tubing pressure 1,600 psi. on ¼-in. choke.

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DESIGNED AND MANUFACTURED to accommodate the longest and heaviest casing strings.

MAINTAIN perfect alignment at all times and automatically center the casing in the bushing.

For further information write P.O. Box 1348, Houston 1, Texas or see The Composite Catalog.

Because of the heavy weight of most casing strings and the relatively thin wall of the pipe, it is extremely important that the slips used for supporting casing strings be especially designed to insure a full-circumferential grip on the surface of the pipe. BAASH-ROSS TYPE "UC" CASING SLIPS eliminate the problems encountered when using other type casing slips. Buy through your supply store.

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TOOL COMPANY
DIVISION OF JOY MANUFACTURING COMPANY

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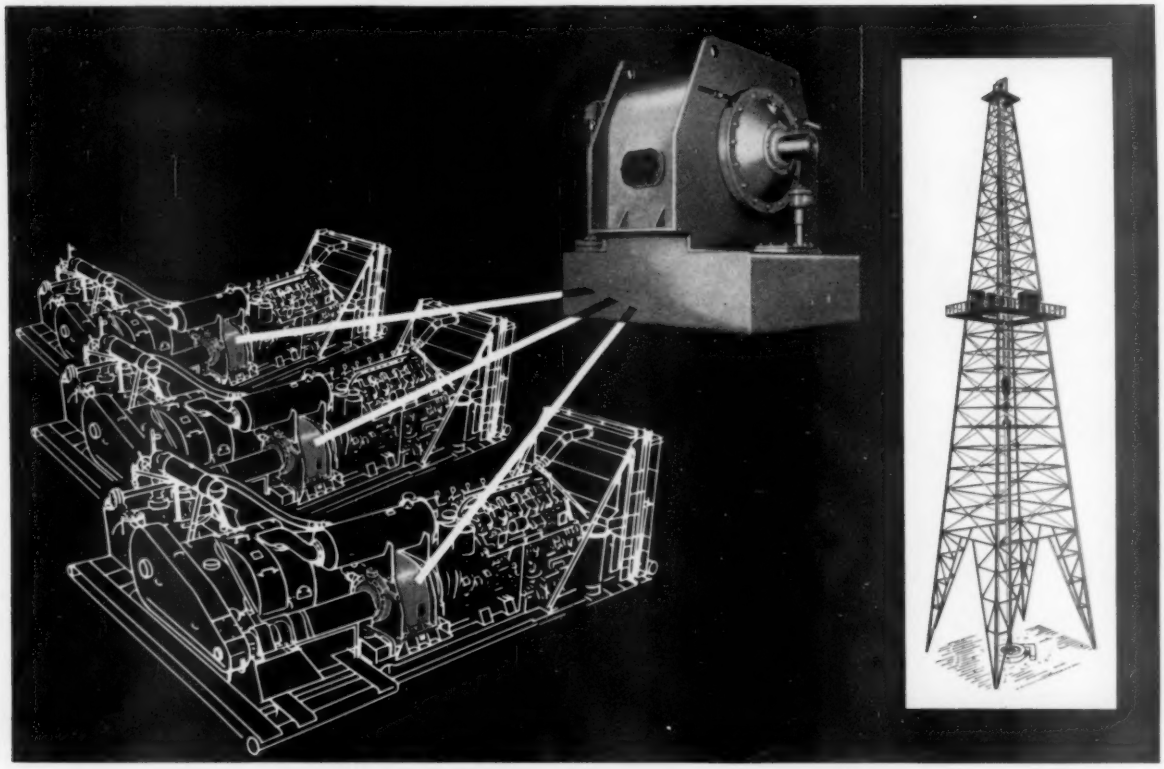
AMERICAN BLOWER *Gýrol*® FLUID DRIVE . . .



Class 2F, Type VS Gýrol Fluid Drive, 280 hp to 820 hp, speeds to 1200 rpm.

Here's how to provide smooth, stepless, adjustable power for oil-field operations

For smoother power transmission, with the cushioning effect of fluid flow . . . *stepless, adjustable speed*, controlled remotely, manually or automatically . . . *flexible pump control*, quickly and easily manipulated in compound-design setups . . . it will pay you to investigate the American Blower Gýrol Fluid Drive.

Draw Works—When hoisting and lowering drill pipe and casing, and for cathead and fishing operations, the Gýrol Fluid Drive provides smooth, protective acceleration—even from a standstill against a full-connected hoist load. It transmits maximum engine torque with minimum danger of engine stall.

Rotary—Gýrol Fluid Drive provides adjustable, stable speed to the rotary table. Its high-efficiency transmission utilizes maximum engine power. And when low, creeping speeds below minimum engine rpm are required, the Gýrol Fluid Drive will supply them without danger of stalling.

Slush Pumps—For smoother operation and maximum-efficiency power transmission between engine and slush pump, use the Gýrol Fluid Drive. When pressure and depth increase, and your engine reaches full load, the Gýrol Fluid Drive allows adjustable-speed pump operation while the engine operates in its most efficient range.

Call your American Blower branch office for full information, or write American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

AMERICAN BLOWER

Division of AMERICAN-Standard

Successful Wildcats

Runnels County: Ambassador Oil Corp. 1 Holle, E. S. Fields Sur. 40, 5 mi. E Norton. IP 132 BOPD, 14/64-in., TP 850 psi., GOR 3950, 58°, Jennings sand 4,408-14 ft. TD 4,798 ft.

Runnels County: Sidney H. Davis 1 Walter Adami, Juan Jose Ximenez Sur. 265, 6 miles SE Winters. IPP 23 BOPD, 41°, GOR 465, Gardner 4,037-44 ft. TD 4,500 ft.

TEXAS GULF COAST

Bee County: A. A. Moore 1 Zawarka, Bee County School Land, A-102. Shut-in gas well, no gage, perfs. 2,091-93½ ft. TD 2,689 ft. (New field.)

Bee County: Christi, Mitchell & Mitchell and Frio Drilling Co. 1 Hart et al, James Douglas Sur., A-19 (3 miles NE of Papalote). IP 2,600 M.c.f. daily, open-flow potential, dry gas, perfs. 5,200-06 ft. (Frio). TD 5,915 ft. (New pay and extension in Massingill-Papalote area.)

Chambers County: Kilroy Co. of Texas, Inc., 2 MacCarthy, HT&B Sur. 93, A-155. IPP 60,000 M.c.f. daily, open-flow potential, GLR 23,500 cu. ft. per barrel, 58°, perfs. 9,525-29 ft. (Nodosaria). TD 9,751 ft. (New pay in North Willow Slough field.)

Chambers County: Sun Oil Co. 1 State Tract 288, Galveston Bay, 1¾ miles SW of Red Fish Reef field). IP 214 BOPD, XX-35 choke, 38.3°, GOR 626 cu. ft. barrel, perfs. 9,358-65 ft. TD 11,394 ft. (Discovery well Southwest Red Fish Reef field.)

Sun Oil Co. 1 State Tract 262, Galveston Bay. IP 5,650 M.c.f. daily, open-flow potential, GOR 39 M.c.f. per barrel, 59°, perfs. 10,343-47 ft. TD 11,798 ft. (New pay and confirmation well Southwest Red Fish Reef field.)

Galveston County: Hassie Hunt, Trust, 1 Sayko et al, Lemuel Crawford Sur. 308, A-47 (2 miles west of Alta Loma). IP 326.4 BOPD, ⅛-in., 30.5°, GOR 1,075 cu. ft. per barrel, perfs. 11,288-97 ft., and (dual completion) 8,000 M.c.f. daily, open-flow potential, GLR 24.1 M.c.f. per barrel, 47.1°, perfs. 11,512-22 ft. TD 12,000 ft. (New field.)

Jackson County: H. H. Howell and M. B. Rudman et al 2 W. P. Jackson estate, S. C. A. Rogers Sur., A-65 (2 miles west of Ganada). IP 61,000 M.c.f. daily, open-flow potential, perfs. 4,296-4,306 ft. (Frio). TD 6,012 ft. (New pay at Sandy Creek.)

Matagorda County: J. S. Michael 1 State Tract 448-S, Gulf of Mexico. Shut-in gas-well, no gage. TD 6,600 ft. (Extends South Sargent field offshore.)

San Jacinto County: J. C. Barnes and Cities Service Oil Co. 1 Johnson et al, Jose de la Garza Sur., A-18. IP 4,600 M.c.f. daily, open-flow potential, GLR 70 M.c.f. per barrel, 48.1°, perfs. 11,530-35 ft. (Wilcox). TD 12,015 ft. (New field.)

San Patricio County: Jake L. Hamon et al 1-A Hart, Day Land & Cattle Co. Sur., Blk. 2, A-388. IP 16,000 M.c.f. daily, open-flow potential, GOR 49 M.c.f. per barrel, 62.6°, perfs. 6,290-96 ft. TD 7,315 ft. (Discovery well East Riverside field.)

Victoria County: Harkins & Co., Argo Oil Corp., and George A. Musselman 1 Dentler, Patrick Dowlearn Sur., A-157 (5 miles northwest of Mission Valley). Shut-in gas well, no gage, perfs. 8,500-10 ft. and 8,540-50 ft. TD 9,066 ft. (New field.)

Skinner Corp., Newman Brothers Drilling Co., and H. L. Ryman 15-A Keeran, Martin de Leon Sur., A-74 (6½ miles NE of Placedo). IP 55 BOPD (net), 15 per cent water, GOR 400 cu. ft. per barrel, 23°, perfs. 4,748-50 ft. TD 4,755 ft. (New gas area east of Keeran field and north of Southeast Keeran field.)

1957 Yearbook Issued

Rinehart Oil News Co., Dallas, has announced the release of its 1957 edition of its annual reference publication, Ira Rinehart's Yearbook.

The two-volume reference work follows the standard editorial format employed in previous editions and contains a detailed report on approximately 2,260 oil and gas wells completed during 1956 as new field or reservoir discoveries, or as major extensions to existing fields. Twenty-nine areas are covered, including the Rocky Mountain states, Four Corners, New Mexico, Texas, Louisiana and southeastern states.

A separate section of the book is given over to each area, and each section contains a summary report on regional trends along with other pertinent historical material. Discovery sections are replete with state, area and field maps, with locations of important operations indicated.

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your cost of operation
with
Custom-Built DUNLAP

INDUSTRIAL SHUTTERS

Your operating cost goes down as your engine efficiency goes up. Dunlap Industrial Shutters will increase efficiency by keeping your cooling unit at constant temperature (within 2°).

Our years of experience in shutter-manufacturing has taught us that you want and need these features:

1. **SIMPLICITY** — The installation shown above (top, left) illustrates the ease with which Dunlap Industrial Shutters are installed. The 18 sections were assembled by simple bolting and linkage to form one large unit (24' x 96').
2. **DURABILITY** — Heavy-duty frames, bracing and blades are made of 14 and 16 gauge steel to withstand maximum use and most extreme conditions of vibration, temperature and weather. All moving parts in brass bearings.
3. **VERSATILITY** — Dunlap Industrial Shutters are custom-built to the exact dimensional requirements of any size cooling unit and may be operated manually or automatically from as many points as desired. No job is too big, or too small.

See your heat exchange dealer or contact . . . .

DUNLAP MANUFACTURING CO.

5016 E. Admiral Place • Tulsa, Oklahoma

Brown aims for bull's-eye as . . .

Tidewater Sets Up New Targets

THE Rocky Mountains and Canada will be two of the main areas in Tidewater Oil Co.'s stepped-up exploratory program this year.

Busily carrying out plans for 1957 is Charles Brown, who is beginning his second year as vice president and general manager of Tidewater's central division in Tulsa.

Under Brown's leadership, the central division is expanding Canadian operations to include Alberta and will accelerate exploratory efforts in the Rocky Mountains.

Tying in with Tidewater's interest in the Paradox basin is the proposed 16-in. crude line from the Four Corners area to the southeastern corner of New Mexico *(The Oil and Gas Journal, December 24, 1956, page 35)*.

A 515-mile, 50,000-bbl. line is being considered by Texas-New Mexico Pipe Line Co., owned jointly by Tidewater, The Texas Co., Sinclair Pipe Line Co., and Empire Gas & Fuel Co. (Cities Service Co.).

The Canadian job . . . In Alberta, Tidewater has opened an office in Calgary and is acquiring acreage. In the past, activity had been confined to Saskatchewan, where Tidewater is operator for a four-company venture with Ohio Oil Co., Atlantic Refining Co., and Columbian Carbon Co.

An exploratory program in the southern part of the province was initiated in 1949, at which time the venture involved 9 million acres. Since then, approximately 350 wells have been drilled on the permits, of which 250 were wildcats. The Dollard and Instow fields are the most important of six pools discovered in the four-company program. Plans call for a dozen wildcats the first half of this year.

The group's acreage lies north of the very active area in the southeastern corner of the province, where the industry has discovered a number of important pools in formations of Mississippian age.

Brown's career . . . When Brown moved to Tulsa from San Francisco last winter to take charge of the central division, it was the first time that he had ever lived anywhere but the Golden Gate city.

In his new capacity, he directs all Tidewater operations in 27 states and western Canada, including Pennsylvania on the east, and West Texas on the south.

The division's 2,467 producing wells average about 27,500 bbl. daily—one-fourth of Tidewater's domestic production. Much of this production is in West Texas.

In his 39 years with Tidewater and affiliates, Brown has served in various capacities. His first "real job" began in 1929 when he became assistant to the president of Associated Oil Co., a Tidewater affiliate.

He was named vice president of Tide Water Associated Oil Co. in 1948, and vice president and assistant general manager of the company's western division in 1954.

He and his wife, Rubye, have a son, Charles Howard Brown, who is following in his father's footsteps. Young Brown recently received his master's degree in business administration from Stanford University, and is now with Standard Oil Co. of California in San Francisco.

Diversified activity . . . Tidewater's Brown is active in both industry and civic affairs. In 1955 he served as chairman for the San Francisco Community Chest Drive.

When the big A.P.I. convention was held in his home town that year, he was in charge of arrangements for entertainment. His interest in public relations has taken him into the Oil Information Committee, where he serves as a national committeeman.

When the A.P.I. Division of Production holds its Mid-Continent district meeting in Tulsa April 10-12, he will be general chairman in charge or arrangements.

The genial Charles Brown believes in "working hard and learning much as you go along," and that philosophy may mean a bull's-eye for Tidewater's new targets in the Rocky Mountains and Canada.

R. G. Sanders, assistant manager of Magnolia Petroleum Co.'s refining division at Beaumont since 1938, has been named manager of the division. He also has been named vice president and a director of Magnolia. **L. H. True,** president of Magnolia Pipeline Co., has also been elected a director of Magnolia. Sanders succeeds **John W. Newton** as refining division manager. Newton will retire May 1. Two other Magnolia vice presidents and directors have been named. They are **George J. Gregor,** promoted from assistant marketing manager to vice president in charge of marketing at Dallas; and **Charles B. Wallace,** general counsel.

R. G. SANDERS

L. H. TRUE

Waheed K. Ghauri, development engineer with Shell Oil Co. in Bakersfield, Calif., has been transferred to Los Angeles. **Richard E. Wyman,** also development engineer, will move to Bakersfield from Los Angeles. **George Lozano** and **Millard L. Woodson,** mechanical engineers, have also been transferred. Lozano moved to Bakersfield from Ventura, Calif., and Woodson to Ventura from Bakersfield.

Personals

A. L. ROBERTS

A. L. Roberts, vice president and general superintendent of Texas Gas Transmission Corp., has been named vice president in charge of operations succeeding the late L. E. Ingham. Roberts had been general superintendent since 1949 and a vice president since 1956. Roberts supervised construction of the company's big-inch line from Texas and Louisiana to Ohio in 1948.

Ed S. Sabatka, geologist with Sinclair Oil & Gas Co., has joined E. K. Drilling Co. in Wichita as Kansas district geologist.

Claude M. Langton, chief geologist with Hult Oil Co., Dallas, has joined Beck Oil Co. as head of the company's new Lafayette, La., district office.

R. A. Bishop, northwest division geologist with Sohio Petroleum Co., has been appointed staff assistant-exploration in Oklahoma City. **Dr. A. C. Munyan,** staff geologist, northwest division, will replace Bishop as division geologist.

Donald W. Frison, manager of the Du Pont Co.'s Mid-Continent region, petroleum chemicals division, Tulsa, has been appointed manager of the central region and transferred to Chicago. **Charles D. Towery** will replace Frison as Mid-Continent manager in addition to his duties as Gulf Coast region manager in Houston.

S. A. SWENSRUD

Sidney A. Swensrud, chairman of the board of Gulf Oil Corp., will retire April 23 after nearly 30 years in the oil industry. Swensrud joined Gulf in 1947 as executive vice president. He had previously been executive vice president of Standard Oil Co. (Ohio). He was elected president of Gulf in 1948 and became board chairman in 1953.

John Batzer has replaced **E. O. Sowerwine, Jr.,** as general manager of Big Horn Refining Co., Lovell, Wyo. Sowerwine has returned to consulting work. Batzer was formerly vice president of the firm, which purchased Ohio Oil Co.'s abandoned refinery at Lovell last year.

Frank E. Byrne has been appointed district geologist in Casper, Wyo., for Tidewater Oil Co. Byrne joined Tidewater in 1955.

Edward W. Upton, vice president and general manager of the F. H. Maloney Co., Houston, has joined the Refinery Engineering Co. as executive assistant to the company's president. **Thomas M. Lumly.**

William E. Bawden, Jr., has been promoted to plant engineer at The Texas Co.'s Sunburst, Mont., refinery. Bawden, assistant plant engineer since 1955, succeeds **Francis J. Engel,** who has been transferred to Texaco's Casper, Wyo., refinery.

Olin Culberson, chairman of the Texas Railroad Commission, has been appointed a member of the regulatory practices committee of the Interstate Oil Compact Commission. **Ernest O. Thompson,** another T.R.C. member, has been appointed chairman of the legal committee of I.O.C.C.

C. C. SWOOPE

Charles C. Swoope, general superintendent of Esso Standard Oil Co.'s Bayonne, N. J., refinery, has been appointed manager of the company's Baltimore refinery. **Stanley A. Wuchter,** manager of southern East Coast refineries for Esso, has been named consultant at Baltimore. Wuchter will retire in September. **C. A. Brown,** general superintendent at the company's Charleston, S. C., refinery, has been appointed manager there in a move aimed at decentralizing operations at Esso's refineries. Swoope, new manager at Baltimore, became general superintendent at Bayonne earlier this year. He has been with Esso since 1928 and was head of the company's East Coast technical division before going to Bayonne in 1956 as assistant superintendent.

Dr. John G. McNab, deputy coordinator of petroleum products and medical research for Esso Research & Engineering Co., has been promoted to coordinator. McNab was director of the products research division at Esso's Linden, N. J., research center before becoming deputy coordinator of products and medical research last year. A graduate of the University of Chicago and Queen's University, he joined Esso in 1936.

Kenneth J. Parr, engineer with Pan American Petroleum Corp., has been transferred to Fort Worth from Tulsa.

D. F. Kralis, formerly an independent operator, has been appointed division manager of Clark Oil & Refining Co.'s new exploration and production division office in Denver.

R. V. McGRATH

R. V. McGrath, chief process engineer for Cities Service Oil Co., has been named staff assistant to the manager of the company's refining division. **J. S. Brendler** has been appointed head of the refining division's new technical department. McGrath joined Cities Service in 1926. Brendler has been with the company since 1939.

John D. Gauntt, Jr., has been named district geologist in the Corpus Christi, Tex., area for Trunkline Gas Co. Gauntt was formerly assistant district geologist in Corpus Christi for Skelly Oil Co.

J. L. Irvin, general manager of Gulf Refining Co.'s pipeline department, and **C. C. Combs,** vice president and treasurer of Shell Pipe Line Corp., have been elected vice presidents of Four Corners Pipe Line Co. **Ralph G. McIntyre,** retired chairman of the board of Standard Oil Co. of Texas and president of Pasotex Petroleum Co. and Pasotex Pipe Line Co., was recently named president of the new company. Other officers are **R. J. Northway,** Shell Pipe Line Corp., secretary and assistant treasurer; **J. H. O'Hare,** Shell Pipe Line Corp., treasurer and assistant secretary; and **C. M. Wright,** New York, assistant secretary. Directors are McIntyre; Irvin; **T. A. Van Griethuysen,** vice president of transportation and supply for Continental Oil Co.; **R. D. McGranahan,** Gulf Oil Corp. vice president for transportation; **D. E. Day,** vice president of Richfield Oil Corp.; **D. B. Hodges,** New York; **A. G. Schei,** treasurer, Shell Oil Co.; **G. A. Davidson,** vice president in charge of pipelines for Standard Oil Co. of California; **F. C. Loomis,** vice president of supply and transportation with Standard Oil Co. of California, Western Operations, Inc.; and **S. H. Durkee,** Superior Oil Co. treasurer. Four Corners stockholders are Continental, Gulf, Richfield, Shell, Standard of California, and Superior.

A.P.I. District Production Officers Elected

W. R. Johnston of Northwest Production Corp., Albuquerque, center, has been elected district chairman of the American Petroleum Institute's division of production southwestern district. Johnston succeeds P. E. Fletcher, Atlantic Refining Co., Midland, right, who becomes chairman of the district advisory committee. Other officers are, left to right, A. J. Evans, Warren Petroleum Corp., Abilene, West Central Texas vice chairman; Horace Shumate, Loffland Brothers Co., Midland, West Texas vice chairman; and R. M. Lilly, second from right, Humble Oil & Refining Co., Albuquerque, northwest New Mexico vice chairman. Not pictured are the following vice chairmen, Paul Peters, The Texas Co., Wichita Falls, North Central Texas; W. E. Owen, Shell Oil Co., Hobbs, N. M., Southeast New Mexico; Murray McNichol, Service Pipeline Co., Lubbock, South Plains; and Robert K. Beggs, Sun Oil Co., Gainesville, Northeast Texas. Alan Antweil, Hobbs Pipe & Supply Co., Hobbs, N. M., is district secretary-treasurer.

Harvey Menard has been named manager of operations in the gas department of Signal Oil & Gas Co., Los Angeles. **David R. Arnold** has joined Signal's gas department as manager of engineering and construction.

S. L. WESTLAKE

Stanley L. Westlake, chief engineer of Magnolia Pipe Line Co., has been elected a director. Westlake joined Magnolia after serving as a pipeline consultant to the Petroleum Administration for War. **David H. Levy,** general superintendent of the company's communications and electrical department, has also been elected a director. Levy has been with Magnolia since 1927.

Dave Moore, district manager for Hancock Oil Co. in Casper, Wyo., has opened his own geological consulting offices there. **W. A. Sears, Jr.,** and **John H. Larsen** have been promoted to district geologists for Hancock in Casper and will have joint responsibility for the Rocky Mountain district office there.

Bill L. Faulk, production foreman at Dominguez field, Los Angeles, has been transferred by Shell Oil Co. to Ten Section field in San Joaquin Valley as district production foreman.

James C. Stopford, vice president and general manager of Honolulu Gas Co., has been elected president. Stopford was with Shell Oil Co. and with Delta Engineering Co. before joining Honolulu Gas Co. in 1951.

Harold J. Rose, coordinator of chemicals research for Esso Research & Engineering Co., has been appointed assistant general manager of Esso Standard Oil Co.'s chemical products department. Rose joined Esso Standard in 1942 at the company's Baton Rouge, La., refinery.

A. W. Black, Continental Oil Co.'s assistant regional geophysicist in Denver, has been promoted to regional geophysicist of the company's Rocky Mountain region. He replaces **C. B. Smith, Jr.,** recently named Rocky Mountain exploration manager. **C. M. Ferree,** Conoco's division geophysicist in Casper, Wyo., will succeed Black as assistant regional geophysicist in Denver.

Personals

Sam T. Boltz, Jr., petroleum engineer with The Texas Co., has been promoted to production foreman and transferred to Hamilton, Colo., from Meeker, Colo.

Henry Marchman has been named research associate in the chemical products division at the Whiting, Ind., laboratories of Standard Oil Co. (Ind.). Marchman joined Indiana Standard in 1954.

E. W. Masters, a director of Great Lakes Oil & Chemical Co., has been elected executive vice president. Masters, a Los Angeles consultant and formerly with Shell Oil Co., was elected a director of Great Lakes late last year.

Lee S. Miller, East Lansing, Mich., petroleum consultant, has retired after 35 years in the oil business. Miller, as manager of Carter Oil Co.'s natural-gasoline division, was a pioneer in introducing oil and gas repressuring. He was later petroleum engineer with the Michigan State Department of Conservation, retiring from this position in 1954 to go into consulting work.

DEATHS

Charles A. Chipman, 66, Bolivar, N. Y., oil producer, president of the Pennsylvania Grade Crude Oil Association, and director of the New York State Oil Producers Association, died March 7 near Deland, Fla., after a heart attack. Chipman was also a director of the American Petroleum Institute and the National Petroleum Council.

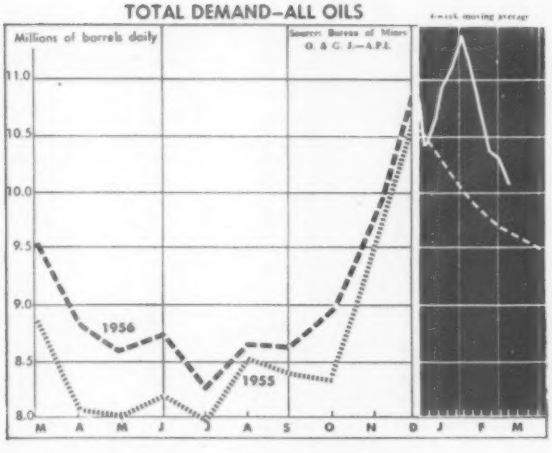
Charles W. Haynes, 58, treating-plant superintendent with Sunray Mid-Continent Oil Co. in Tulsa, died March 10 in Tulsa. Haynes joined Cosden Oil Co., forerunner of Sunray Mid-Continent, in 1916.

Frank S. Haynes, 79, automotive pioneer and inventor of oil-field equipment, died March 11 in Tulsa. Haynes, manager of western operations for Bradford Supply Co. before his retirement in 1953, invented an oil-field equipment clutch which is still in use. He developed with Matt Primm the Primm oil engine, first engine operated by crude oil. He was also connected with the Haynes automobile, one of the earliest American made gasoline driven automobiles, manufactured until 1923.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,800,475	UP	268,500	UP	519,464
Crude stocks	253,656,000	UP	1,972,000	DOWN	4,431,000
Completions	886	DOWN	148	DOWN	115
Refinery runs	8,076,000	(No change)		UP	94,000
Gasoline stocks	205,782,000	UP	2,008,000	UP	10,113,000
Kerosine stocks	20,711,000	DOWN	758,000	UP	2,442,000
Distillate stocks	83,331,000	DOWN	2,367,000	UP	13,592,000
Residual stocks	36,383,000	DOWN	681,000	UP	1,518,000
Four-product stocks	346,207,000	DOWN	1,798,000	UP	27,665,000
Total imports	1,317,900	UP	227,000	UP	78,000



Crude Stocks Will Rise Sharply During the Month of April

CURRENT production and refinery trends point to a buildup in crude stocks to about 262,000,000 bbl. by the end of March. Such an increase will call for a sharp cut in crude supply for April. However, there are a few ifs.

Let's start with the ifs. If Iraq Petroleum Co. lines continue to deliver crude to the eastern Mediterranean, shipments from United States to Europe will taper off in March. Further cuts will be made in April if the Suez Canal is opened for traffic.

Here's the way the crude picture shapes up for March. Crude production in this country will average about 7,760,000 bbl. daily. Crude imports seem to be headed for an average of about 800,000 bbl. daily for an over-all new supply of crude amounting to 8,560,000 bbl. daily.

The outlook for refinery runs in March is about 8,000,000 bbl. daily. Crude transfers and losses will account for about 50,000 bbl. daily. If crude exports drop to 210,000 bbl. daily, the over-all demand for crude will be 8,260,000 bbl. daily.

With supply at 8,560,000 bbl. daily and demand at 8,260,000 bbl. daily, additions to crude in storage would be 300,000 bbl. daily. This rate would add a little more than 9 million barrels to the total of 253 million barrels on hand at the first of February. Crude stocks at 262 million barrels would be about normal for the end of March. No further additions would be needed in April.

Refinery runs always drop to the low point of the year in April. Last year, April runs were 425,000 bbl. daily less than in March. The cut this year should bring the average down at least to 7,725,000 bbl. daily. This would be only 225,000 bbl. daily under the estimate for March.

Crude transfers and losses will take about 50,000 bbl. daily. If crude exports are down to 100,000 bbl. daily, total demand for crude would average 7,875,000 bbl. daily.

Since there will be no need for additions to crude inventories in April, an attempt should be made to bring supply in line with demand. To cut crude production and imports from 8,560,000 bbl. daily in March to 7,875,000 bbl. daily in April would mean a reduction of 685,000 bbl. daily. There is very little chance that this can be accomplished.

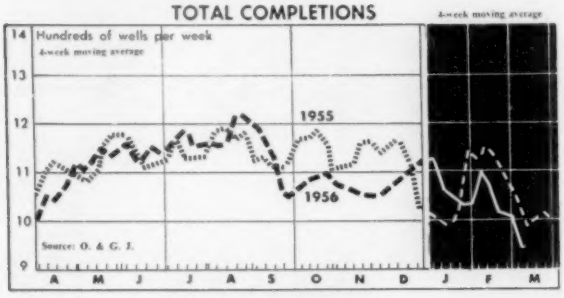
All of these trends point to a stock surplus at the end of April. If refinery runs are kept at a high level, some of the increase will be in product tanks rather than crude storage.

If demand for crude holds at about 7,850,000 bbl. daily in April and new supply stays at 8,560,000, crude stocks would climb to about 282 million barrels by the end of April.

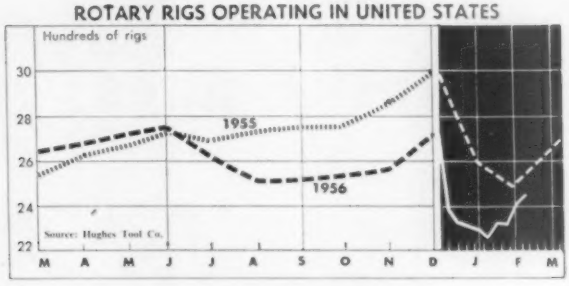
If you think exports will be 50,000 bbl. daily higher than the above estimates, cut 3 million barrels off the end-of-March stock total. It's still too high.

Stocks of the four major refined products now exceed last year's total by about 25 million barrels.

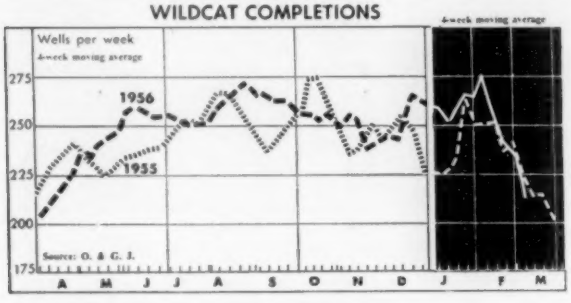
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	3-11-57	3-4-57	3-12-56
North Central and East	82	78	102
Southeast	37	36	33
Okla., Kans., Ark., Mo.	426	423	506
Louisiana	442	438	406
North and East Texas-Panhandle	394	396	438
Gulf and South Texas	234	232	264
West Texas-New Mexico	513	500	540
Rocky Mountain	216	210	210
Pacific Coast	99	96	129
Total United States	2,443	2,409	2,628
Western Canada	250	244	244

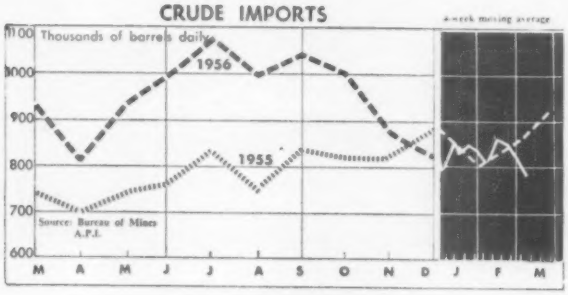
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 9, 1957

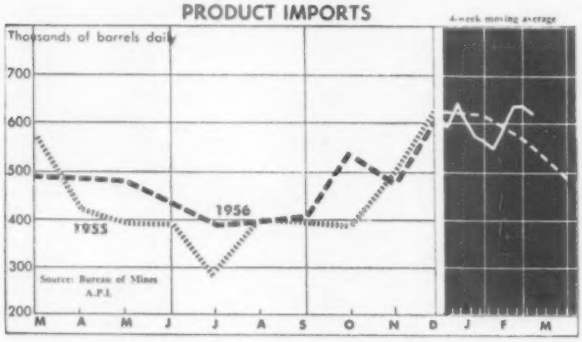
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	*3	3	0	0	34,360	14	21	0	0	0	0	0	0	0	0	5	5
Arkansas	29	20	1	8	74,947	206	124	1	0	0	3	4	5	0	0	25	30
California	37	22	1	14	186,371	395	392	0	0	0	11	11	7	0	2	98	107
Colorado	13	2	2	9	64,870	217	226	1	0	0	7	8	7	0	3	134	144
Illinois	31	8	3	20	70,112	462	692	0	0	1	5	6	7	0	1	99	107
Indiana	4	1	1	2	5,197	122	111	0	0	0	0	0	3	0	0	19	22
Kansas	69	36	2	†31	249,607	801	925	2	0	0	9	11	26	0	4	112	142
Kentucky	25	11	4	10	33,984	278	332	1	0	0	3	4	8	0	1	53	62
Louisiana	58	34	3	21	427,092	709	772	0	2	0	10	12	16	6	17	84	123
North	22	11	2	9	75,727	276	286	0	0	0	4	4	2	0	2	31	35
South	27	15	1	11	267,552	315	390	0	2	0	6	8	8	6	13	47	74
Offshore	9	8	0	1	83,813	118	96	0	0	0	0	0	6	0	2	6	14
Michigan	11	3	0	8	34,275	78	98	0	0	0	4	4	3	0	0	29	32
Mississippi	7	1	1	5	39,502	60	87	0	0	0	4	4	4	0	0	25	29
Montana	4	3	0	1	29,489	58	75	0	0	0	1	1	2	0	0	19	21
Nebraska	11	5	0	6	61,751	145	175	1	0	0	5	6	8	0	0	74	82
New Mexico	44	22	16	6	169,499	385	359	0	0	0	2	2	14	1	4	41	60
Northwest	22	4	15	3	80,319	146	132	0	0	0	2	2	6	1	3	13	23
Southeast	22	18	1	3	89,180	239	227	0	0	0	0	0	8	0	1	28	37
North Dakota	5	4	0	1	32,902	65	43	0	0	0	1	1	4	0	0	22	26
Ohio	13	6	2	‡5	22,585	191	207	0	0	0	0	0	0	0	0	3	3
Oklahoma	129	83	2	§44	414,170	1,313	1,661	1	1	0	13	15	24	4	1	122	151
Pennsylvania-New York	10	1	7	2	47,437	59	145	0	0	1	1	2	0	0	7	13	20
Texas	348	201	14	133	1,482,577	4,205	4,016	8	2	4	82	96	134	7	48	1,006	1,195
Southwest (1 & 4)	23	11	1	11	78,322	479	607	0	0	0	8	8	17	2	14	157	190
Gulf Coast (2 & 3)	50	18	10	22	338,660	518	508	2	2	4	11	19	14	2	26	145	187
East (5 & 6)	17	6	2	9	112,501	244	234	0	0	0	7	7	4	0	1	69	74
N. Central (7-B & 9)	115	60	0	55	312,694	1,547	1,358	2	0	0	33	35	65	0	2	463	530
West (7-C & 8)	126	92	0	34	588,496	1,130	1,093	4	0	0	23	27	32	0	4	152	188
Panhandle (10)	17	14	1	2	51,904	287	216	0	0	0	0	0	2	3	1	20	26
Utah	1	0	0	1	6,253	25	16	0	0	0	1	1	3	0	0	10	13
West Virginia	15	1	12	2	42,743	132	122	0	0	1	0	1	0	0	7	2	9
Wyoming	17	3	1	13	84,284	154	153	0	0	0	8	8	7	0	2	50	59
Misc. (Wash., Nev.)	2	0	0	2	7,445	17	46	0	0	0	2	2	0	0	1	10	11
Total U. S.	**886**	470	72	344	3,621,452	10,091	10,798	15	5	7	172	**199**	282	18	98	2,055	2,453
Total previous week	1,034	562	80	392	4,097,229	....	....	26	1	9	191	227	267	13	91	1,883	2,254
Total Mar. 10, 1956	919	526	55	338	3,869,462	....	....	27	2	8	159	196	318	30	75	2,029	2,452
Cumulative 1957	10,091	5,406	743	3,942	41,508,388	....	....	....	....	....	....	....	....	....	....	....	....
Western Canada	68	40	7	21	316,477	466	418	3	0	6	17	26	8	0	13	102	123

Service wells included: †1, ‡2, §5. *Alabama.

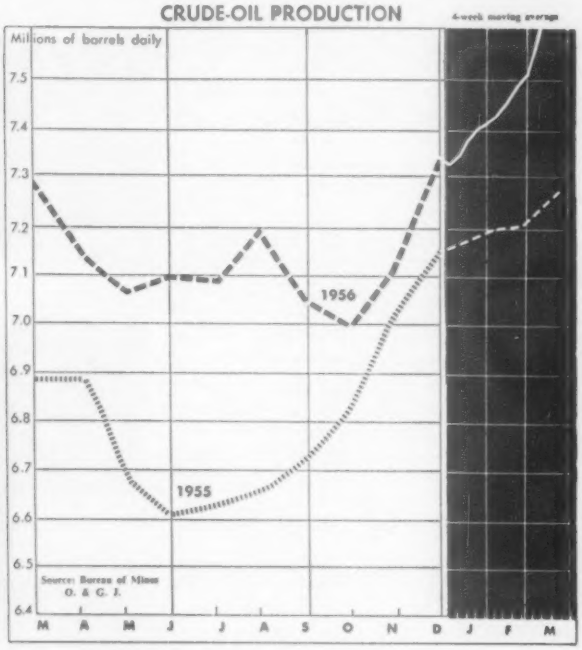
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

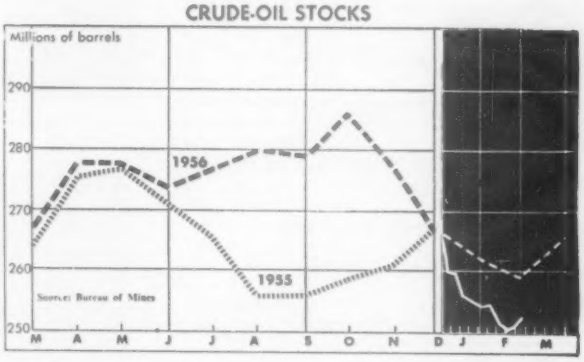


DAILY AVERAGE PRODUCTION FOR WEEK

	March 9, 1957			March 2
	Crude oil	Lease condensate	Total	total
Alabama	11,650		11,650	11,700
Arkansas	83,300	300	83,600	81,100
California	939,200		939,200	936,800
Colorado	158,200		158,200	158,350
Eastern	50,900		50,900	50,400
Florida	1,250		1,250	1,250
Illinois	231,800		231,800	233,900
Indiana	33,100		33,100	32,200
Kansas	†353,200		†353,200	†342,350
Kentucky	50,200		50,200	50,300
Louisiana	938,600	76,250	1,014,850	977,500
North	128,600	3,000	131,600	131,500
South	810,000	73,250	883,250	846,000
Michigan	28,200		28,200	27,100
Mississippi	109,200	4,950	114,150	112,750
Montana	72,000		72,000	71,850
Nebraska	37,850		37,850	38,650
Nevada	100		100	100
New Mexico	263,200	5,275	268,475	258,275
North Dakota	37,100		37,100	39,700
Oklahoma	†668,400		†668,400	†659,950
Texas	3,277,000	56,000	3,333,000	3,130,350
Dist. 1	57,000	550	57,550	56,525
Dist. 2	164,000	8,900	172,900	160,950
Dist. 3	459,000	26,300	485,300	458,500
Dist. 4	253,000	6,600	259,600	244,500
Dist. 5	44,000	475	44,475	42,500
Dist. 6	147,000	6,200	153,200	144,350
East Texas Field	229,000		229,000	214,000
Dist. 7-B	173,000	100	173,100	165,100
Dist. 7-C	176,000	4,300	180,300	175,400
Dist. 8	1,254,000	1,425	1,255,425	1,157,425
Dist. 9	216,000	850	216,850	212,825
Dist. 10	105,000	300	105,300	98,275
Utah	11,000		11,000	12,900
Wyoming	302,150		302,150	304,400
Others	‡100		‡100	‡100
Total U. S.	7,657,700	142,775	7,800,475	7,531,975
Change from prev. week, up			268,500	
Canada	†463,500		†463,500	†525,800
Total U. S. production, January 1-March 9				509,640,875 bbl.
Same period last year (crude plus cond.)				*497,732,309 bbl.

*Includes 8,889,335 bbl. condensate. †Week ended previous Monday. ‡S. Dakota.

CRUDE-OIL STOCKS



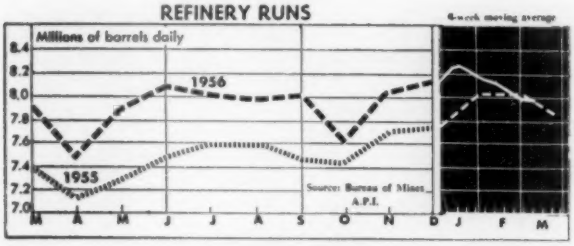
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

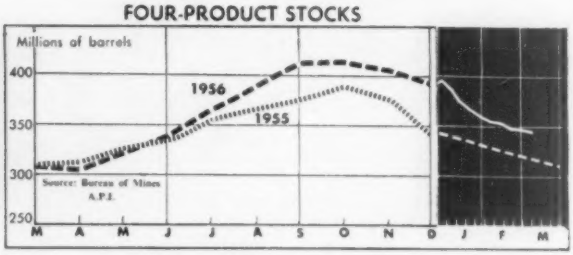
	3-2-57	2-23-57	3-3-56
Pennsylvania Grade	2,442	2,503	2,746
Other Appalachian	2,008	2,045	1,815
Illinois, Indiana, Michigan	10,092	9,783	9,476
Nebraska, North Dakota	1,888	1,988	2,066
Kansas	9,234	9,343	7,957
Oklahoma	21,399	20,535	22,638
Arkansas	2,296	2,405	2,390
Louisiana	20,517	18,902	16,038
North	2,802	2,748	2,475
South	17,715	16,154	13,563
Mississippi	2,014	2,093	3,076
New Mexico	7,135	7,319	8,286
Texas	114,854	114,604	122,281
East Texas proper	10,305	10,420	9,098
West Texas	53,908	54,229	59,800
Texas Gulf	21,806	20,942	22,289
Other Texas	28,835	29,013	31,094
Wyoming	15,934	16,030	15,106
Other Rocky Mountain	5,639	5,902	5,280
California	27,638	26,915	28,021
Foreign	†10,566	11,317	10,911
Total	253,656	251,684	258,087

*Bureau of Mines. †Includes 2,160,000 bbl. in California.

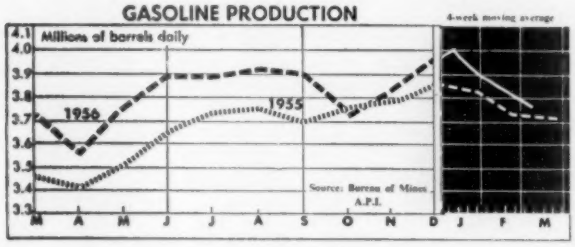
REFINERY RUNS



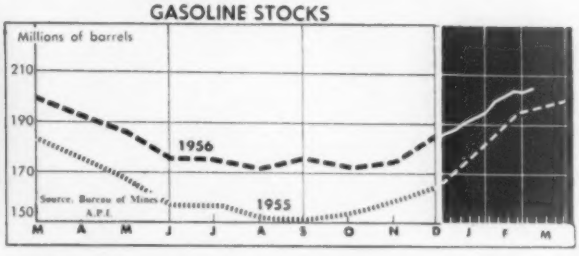
FOUR-PRODUCT STOCKS



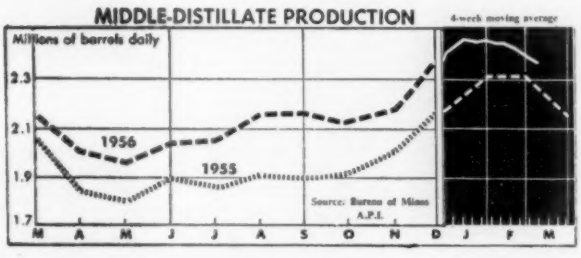
GASOLINE PRODUCTION



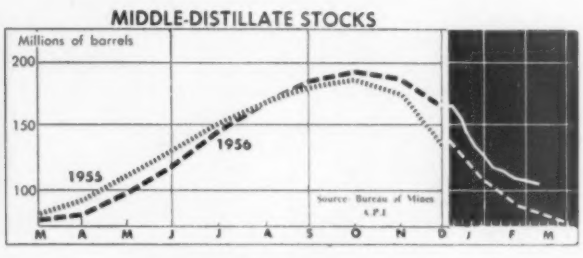
GASOLINE STOCKS



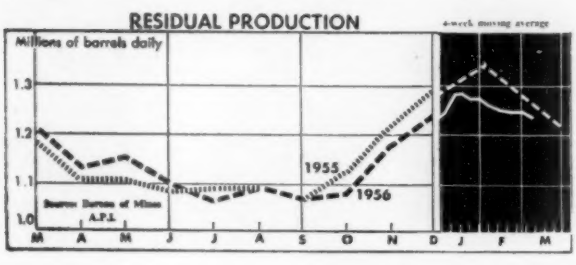
MIDDLE-DISTILLATE PRODUCTION



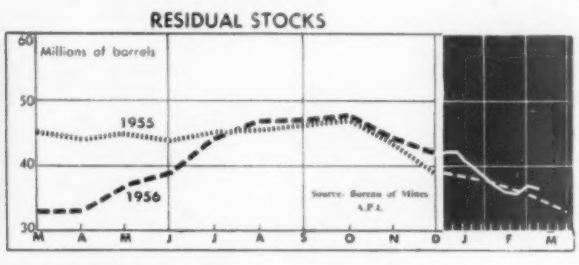
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, MARCH 8, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, March 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,185	490.8	43.7	306.0	214.6	42,046	9,188	27,063	8,752	1,147	447.1	36.6	287.6	217.9
Appalachian:														
District 1	104	42.3	3.9	18.9	5.9	4,934	448	2,073	335	92	34.3	4.0	21.6	7.9
District 2	113	60.1	6.9	20.6	16.3	3,061	340	754	357	104	50.7	7.3	18.7	15.4
Ind., Ill., Ky.	1,408	668.7	78.7	272.1	207.6	36,946	3,765	12,587	4,310	1,394	704.1	74.5	287.3	184.9
Minn., Wis., Dak.	103	48.3	8.3	25.6	8.8	7,050	498	3,904	313	82	39.0	7.0	22.8	6.4
Okla., Kans., Mo.	673	385.7	13.0	170.3	42.1	21,284	768	7,936	936	666	372.5	18.4	159.4	35.3
Inland Texas	267	189.3	11.3	47.9	22.1	8,346	319	1,433	1,744	270	192.4	5.8	55.1	22.2
Texas Gulf Coast	1,986	891.6	109.8	582.1	255.0	29,173	2,557	9,143	5,352	1,983	902.3	113.5	529.9	251.3
La. Gulf Coast	709	346.6	57.1	192.4	56.4	12,857	1,505	4,400	1,842	713	344.6	58.7	173.2	52.9
N. La. and Ark.	100	38.4	7.3	24.1	7.3	5,396	736	2,151	194	71	24.1	4.3	17.3	3.2
Rocky Mountain:														
New Mexico	25	11.9	0.6	4.4	3.0	474	11	80	61	21	10.8	0.4	3.7	2.7
Other Rocky Mtn.	286	130.0	3.4	68.9	37.0	7,848	288	2,343	1,039	262	125.2	5.5	63.4	39.5
California	1,117	505.9	3.3	170.7	349.3	26,367	288	9,464	11,148	1,109	487.0	5.6	167.9	373.9
Mar. 8, 1957	8,076	3,809.6	347.3	1,904.0	1,225.4	205,782	20,711	83,331	36,383	7,914	3,734.1	341.6	1,807.9	1,213.5
Mar. 1, 1957	8,076	3,817.6	358.0	2,025.0	1,224.6	203,774	21,469	85,698	37,064	.....	.....	.....	.....	.....
Mar. 9, 1956	7,982	3,804.0	370.1	1,939.0	1,195.0	195,669	18,269	69,739	34,865	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	12.00-12.25
Premium (96 octane)	13.75-14.00
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-11.75
Premium (97 octane)	13.25-13.50
Premium (98 octane)	13.50-14.00
California (rack):	
Regular (84 octane)	13.1
Premium (93 octane)	14.1
Premium (96 octane)	15.1
Caribbean area (cargoes):	
Regular (87 octane)	11.00
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.25-10.50
Diesel oil (58 d.i. and above)	9.875-10.125
Distillate No. 1	9.875-10.125
Distillate No. 2	9.25-9.50
Gulf Coast (cargoes):	
Kerosine 41-43	10.75-11.00
Distillate No. 2	10.25-10.50
New York Harbor (barges):	
Kerosine 41-43	12.25
Distillate No. 2	11.65
Diesel fuel, 48-52 d.i.	11.95
Caribbean area (cargoes):	
Distillate No. 2	10.25

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.40-2.50
Gulf Coast (cargoes):	
Bunker C fuel	$2.75-3.00
New York Harbor (barges):	
Bunker C fuel	$3.30-3.40
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.75-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.89
16-16.9	2.74	....	....	....	1.94
17-17.9	2.78	....	....	....	1.99
18-18.9	2.82	....	....	....	2.04
19-19.9	2.85	....	....	....	2.09
20-20.9	2.89	$2.75	....	$2.62	2.14
21-21.9	2.93	2.77	....	2.64	2.19
22-22.9	2.97	2.79	....	2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, most of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	3.15
Canada:	
Leduc-Woodbend (flat prices D-2), D-3)	2.78
Redwater (Alta.) D-3	2.67
Smiley-Viking (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

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*Also available at La Salina at 3 cents per barrel less.

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Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific 5VTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd.
8J hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

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18—GR Fin Tubes, 73 Sq. Ft.
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1 Worth LTC-6 800 hp.
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385 CFM 160 lbs.

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500—New Croloy #5, 3" to 6⅝" OD 15 to 32' long

500—4", 4-6% Chrome, headers

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8'x32'3" ACCUMULATOR, 135 PSI @ 650° F.

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20'x28'4" AGITATOR, cone bottom

10,000 bbl. HORTONSPHERE

6500 gal. PROPANE TANK

WELDED TOWERS

8'x34'6"x½" 10 trays

6'x30'x½" 9 trays

5'x58'x⅜" 26 trays

4'6"x30'5"x⅜" 14 trays

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HOT OIL 334 GPM, 1,000 PSI (2)
FIRE 2500 GPM at 426' head
CENTRIFUGAL from 60 to 1500 gal. from 40 to 655' head.
STEAM—Hot Oil—Simplex—Duplex
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DEHYDRATION UNIT (TYPE 20)

PLANT HEATER
Type 20
External diameter of shell ..... 4'3"
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Height to base of furnace ..... 3'0"
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Radiant surface—sq. ft. 103
Heat absorption—BTU/hr 563,000
Type of charge—design conditions HC gas
Capacity #/hr.—design conditions 3040
Specific gravity of charge—design conditions .6
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Two #12-12-107 Type HUR removable type bundle. Shell and tube exchangers, connected in series.
Surface: 107 sq. ft. each. 214 sq. ft. total.
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Two Florite contactors, 30" ID x 34'0" T. to T. Desiccant included. 840# operating pressure. Tested to 1200#. (Good Condition)

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12¾" OD x 11'0" Schedule 40 pipe. Tested to 1200#. (Good Condition)
Unit is equipped with necessary manual controls, valves, fittings, clamps, piping, and supports for operation.
Unit installed in 1947, and never used. Can be seen in The Nueces Company plant yard 5 miles West of Driscoll, Texas. Drawings and flow sheet available.

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WANTED COMPRESSORS, Skid mounted portable packaged units preferred, 300-600 H.P., 3 Stage. Clay Johnson, Phone 6539, Vivian, Louisiana.

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HELP WANTED

REFINERY ENGINEERS. Independent Mid-Continent refinery has openings for Chemical and Process engineers with refinery experience. Process engineering and economic analysis experience very desirable. B.S. degree. Give details and salary consideration. Box J-965, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs. $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

GEOLOGIST, Independent Oil Company needs geologist, preferably with experience in Denver-Julesburg Basin. B.S. Degree. Furnish details of education and experience in letter. Applications will be kept confidential. Box J-990, The Oil and Gas Journal, Tulsa, Oklahoma.

Operations Engineer

Independent oil company has opening for petroleum engineer with four to seven years experience both technical and administrative for responsible position in planning and control. Knowledge of operating procedures, some valuation work and practical oil and gas law would be desirable. Excellent growth opportunities. Please furnish complete details on qualifications, including starting salary required.

Box J-987,
The Oil and Gas Journal,
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Giving age, education, marital status and details of experience.

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Executive Production Superintendent needed by large independent oil company. Man selected must have Petroleum Engineering Degree and know purchasing, drilling, well completions and production practices. Age to 45. Minimum of 12 years experience, mostly on Gulf Coast. Salary depending on experience. All information confidential. Send complete resume to

BOX J-968,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

HELP WANTED

VALUATION ENGINEER for pipeline company headquartered in Los Angeles, California, requires engineering degree and 5 years minimum pipeline experience. Knowledge of ICC accounting desired but not essential. Excellent employee benefits. Box J-975, The Oil and Gas Journal, Tulsa, Oklahoma.

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Graduate Chemical or Menchanical Engineer with minimum 5 years experience in performing similar work with petroleum refiner or contractor. This is a challenging position with an excellent opportunity for growth.

Please airmail in confidence complete chronological resume, including education and employment, salary history and salary requirements, to Personnel Department

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Come South

Major Oil Company has openings for Mechanical, Electrical, Chemical, and Civil Engineers in several phases of refinery engineering and process engineering, and for chemists in research and analytical. Locations near New Orleans; South Arkansas; near Williamsburg, Virginia; and near Galveston-Houston, in booming industrial areas where climates and natural advantages make living more enjoyable for all the family. Attractive salaries and benefit programs. 0-10 years' experience. In replying give age, education, experience, and salary expected.

Director of Industrial Relations

AMERICAN OIL COMPANY
P. O. Box 401
Texas City, Texas

HELP WANTED

INDEPENDENT producing company has opening for young Petroleum Engineer as Field Production Superintendent in Southern Oklahoma area. Major company experience preferred. Must have initiative and be responsible person. Furnish details of education and experience in letter. All replies considered confidential. H. E. Wright, 3300 Republic Nat'l Bank Bldg., Dallas.

GEOLOGIST — Established independent company desires graduate geologist for staff position in Tulsa. Looking for man capable of generating geologic ideas for successful wildcatting. This job will be primarily concerned with the hunt for new reserves rather than field work, engineering, deals or administration. Chiefly interested in Kansas, Oklahoma, and Texas (except Coast). Several years major company experience desirable, prefer age 30 to 40. Salary and override. Write full particulars regarding personal background, education, experience, including any pool discoveries, and salary requirements. Enclose small photo. All replies strictly confidential. Box J-969, The Oil and Gas Journal, Tulsa, Oklahoma.

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Maximum Age to 40

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- FOREMAN ELECTRICAL, 3 yrs. experience.
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- MUD TECHNICIAN, 1 yr. exp. Age to 32.
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All information confidential.
Send complete resume to:
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PROCESS ENGINEER for progressive major oil company. Must be graduate Refinery or Chemical Engineer. Liberal company benefits. Address all replies giving age, education, resume of experience and salary expected to Employee Relations Department, Box 2039, Tulsa, Oklahoma.

PROCESS ENGINEER with two to five years' experience in refinery process work to fill position in newly organized Refining Division Technical Section. Work is of broad nature covering selection of processing steps and economic evaluation of processes. Unusual opportunity for advancement. Will pay moving and transportation expense. Liberal retirement, savings, insurance and health plans. Location—Bartlesville, Oklahoma. Replies will be held in confidence. Send resume of experience and salary requirement to Industrial Relations Division, Cities Service Oil Company, Bartlesville, Oklahoma.

Europ. Chem Co. Seeks AGENT IN LIBYA

with exc. contact to Oil Comp. and field engineers.

Support by own Service Organiz.

Box J-981,
The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEER

Large Independent Oil Company with home office Mid-Continent area has Production Department opening for two aggressive Petroleum Engineers. (1) Prefer man with approximately two years of general production experience. (2) Prefer man with 2 to 5 years of evaluation experience. Send resume of experience and grade transcript to

Box J-978,
The Oil and Gas Journal,
Tulsa, Oklahoma.

The Saudi Arabian Government is open to engage on an eighteen month contract fully qualified and mature American or Canadian

Petroleum Reservoir Engineer

Petroleum Engineer—Specializing in Production

Petroleum Engineer—Specializing in Natural Gas

Write for application form to:

Director General—Petroleum & Minerals

JEDDAH, SAUDI ARABIA

All applications and data submitted will be kept in strict confidence.

HELP WANTED

ESTABLISHED independent oil company desiring to expand engineering department has opportunity for qualified graduate engineer with approximately two years Gulf Coast experience in completions and workovers. Initial replies should include a resume of experience and qualifications. Box J-980, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER. Modern, growing plant in Gulf South has opening for Process Engineer experienced in catalytic reforming, petrochemicals and economic studies. Furnish record of education, experience, and salary requirements. Write Box J-983, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY YIELD ENGINEER. Mid-Continent refinery has opening for Yield Engineer with some accounting background. Must be capable of calculating estimated process yields. State qualifications and desired salary. Box J-966, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOPHYSICIST, Engineering Degree, 10 years interpretation, Party Chief experience Major Company. Seeks responsible position exploration, related fields. Box J-961, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF ACCOUNTANT—Desires position with independent oil producing or drilling company—BSC—Law Student—15 years' experience—will relocate. Box J-973, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION MANAGER experience geology, leasing, drilling, estimates, policy, programs, domestic or foreign. Box J-971, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERINTENDENT — Petroleum Engineering degree: 31 years experience in all phases drilling, workover, production management. Familiar with Texas, Oklahoma and Kansas operations and problems. Married. Available at once. Desire connection with progressive Oklahoma Independent or will consider relocation. Box J-976, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMIST: Six years experience chief chemist. Light products and asphalts. Presently employed. Seek opportunity for advancement. Box J-962, The Oil and Gas Journal, Tulsa, Oklahoma.

QUALIFIED LANDMAN: 8 years experience, major and independent companies, many areas, 33. Excellent recommendations: Box J-974, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN with eleven years experience desires position. Location unimportant. Married with two children. Excellent references. Box J-950, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN: 7 years Major Company desires change. Qualified to evaluate drilling deals, all phases of land work. College studies include geology and Business Law. Currently employed, 29, married, would relocate. Box J-982, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, Secondary Recovery: Six-years supervisory experience; 3-years field, 3-years office. B.S. degree. Age 31, presently employed. Box J-989, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PRODUCTION ENGINEER. Desires responsible position with aggressive independent or small oil company. 10 years intensive and varied production engineering experience with major company in Permian Basin. Married. 36 years old, employed. Box J-991, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION MANAGER-Chief Engineer: 15 years one major. Diversified domestic and foreign drilling, production, and administrative experience. Currently on executive training program, but desire affiliation with aggressive producer offering financial improvement. Box J-986, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with over 5 years of diversified experience in drilling, well completions, and production. Desire opportunity as drilling engineer with offshore drilling contractor. Write Box J-988, The Oil and Gas Journal, Tulsa, Oklahoma.

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WANTED

INDIVIDUALS want settled oil production direct from producer. Box J-985, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—WILDCAT ROYALTIES, fee or override under major company blocks scheduled to be drilled. Any size. We are principals. Box 1034, Houston, telephone CApitol 8-6608.

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LEASE AND DRILLING BLOCKS

OIL WELL FOR SALE: Bargain, on pipe line, good lease. P. O. Box 5194, Tulsa.

HAVE 3500 ACRES in McKenzie County, North Dakota for drilling deal. Will need ten thousand ft. test. Good geology. Albert Arnegard, Jr. Arnegard, North Dakota.

BARTLESVILLE AND ARBUCKLE production for sale: Eight wells, 480 acres, proven locations to drill. Excellent water flood possibilities; lots of gas. Montgomery County, Kansas; telephone 436M, Independence, Kansas.

FOR SALE: 20,000 acres, Nebraska Oil and Gas long time leases. Three drilling blocks with good prospects and some scattered acreage. Immediate sale. 25c per acre. WESTERN OIL CO., INC., Broken Bow, Nebraska.

NEW WELLS two ways. 40 acre lease & well. Deepen to Arbuckle. 3 possible pays. 1/8—$300.00, 1/8—$575.00, 1/8—$1100.00. L. Price, Coweta, Okla.

EXPERIENCED OPERATOR WILL SELL interest to finance drilling shallow well on proven lease near Coweta, Okla. Box 362, Coweta, Okla.

TEXAS PROPERTY with good producing wells available for further development. Cost approximately one million dollars. Smaller situations. Box 2586, Fargo, N. D.

OIL, GAS AND MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

CHAVES COUNTY, N. M.
MAJOR OIL STRUCTURE

MAJOR CO. BLK.: Well to drill PENN, DEVONIAN & ELLENBURGER OIL ZONES. Subsurface & Base Map Indicate Major Field. Royalty & Close In Interests. Data on request to those who Value Great Potential.

W. J. PETERMAN, Geologist
Exploration 1918-1957 Engineering
PORTALES NEW MEXICO

Pipeline Patrol

(Continued from page 176)

Carthy's Bolivian concession to the Chile copper-mining area.

Status: Proposed.

Contractor: Will do own work.

• **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

Cia. Shell de Venezuela.

Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.

Status: Under way.

Contractor: **Williams Brothers Co.**

Completion: 1957.

• **Empresa Nacional Del Petroleo.**

Project: 80 miles of 10-in. from Concor to Santiago, Chile.

Status: Planned.

Gaz de France

Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. lateral to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.

Status: Right-of-way work under way.

Contractor: Being handled by French contractors.

Completion: First stage in 1958; complete system in 1960.

Inland Natural Gas Co., Ltd.

Project: 304 miles of mainline and 25 miles of laterals from Savona to Nelson, B. C.: 150 miles of 12-in.; 112 miles of 10-in.; 67 miles of 6-in. Also will build 400 miles of distribution piping in 31 towns.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.**; Pat Campbell, project manager, office at Penticton.

Completion: October 1, 1957.

Petroleos Mexicanos

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.

Status: Planned.

Saskatchewan Power Corp.

Project: 13 miles of 4-in. lateral to town of Kerrobert, and 10 miles of 6-in. lateral to Kindersley Power Plant, Sask.

Status: Planned.

Contractor: **Banister Construction, Ltd.**

Completion: July 15, 1957.

Project: 300 miles of 1 to 20-in. distribution lines at Regina, Sask.

Status: Planned.

Contractor: **S. E. Construction (Alberta), Ltd.**, and **Pacific Pipeline Construction Alberta), Ltd.**, jointly.

Sui Gas Transmission Co.

Project: 217 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang Magiana, and Montgomery.

Contractors: **Pakistan Constructors**, a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.**, of London.

Project: 145-mile line from Sylhet to Dacca, East Pakistan.

Status: Under consideration. If approved construction could start December 1958.

Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.

Project: 207 miles of 26-in. from Anaco fields to Caracas.

Status: Under way.

Contractor: **Fulghum Contracting Corp.** will be consultants; **Petrogas, S. A.** will engineer and construct the line.

Completion: Spring 1959.

• **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal.)

Status: Under way.

Contractors: **Majestic Contractors, Ltd.** (104 miles from Burstall to Stewart Valley, Sask., R. L. Leaonard, spread supt., office at Cabri.; **Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., J. L. Work, general supt., office at Moose Jaw, and 54 miles from Partoze La Prairie to Winnipeg); **Universal Pipe Line, Ltd.**, subsidiary of **Mannix, Ltd.**, (90 miles from Moose Jaw to Welseley, spread superintendent, Otis Hare, office at Regina, Saskatchewan); **Dutton-Williams Brothers, Ltd.** (97 miles from Deveren to Moosomin, under way, to complete August 1957). **Price-Poole of Canada, Ltd.**, has 100 miles from Miniota to near McGregor to start in 1957. **Marine Pipeline & Dredging, Ltd.** has 30-in. Red River and Assiniboine crossing in Manitoba, to complete March 31, 1957, Ed. Stanley, spread superintendent of Red River crossing, office at Norwood, Ed. Stanley and Don Hartness, spread superintendents for Assiniboine crossing, office at Portage la Prairie.

Completion: Red River crossing to be completed May 31, and Assiniboine River crossing by March 31, 1957.

• **Union Gas Co. of Canada, Ltd.**

Project: 142 miles of 26-in. from Dawn Township to Hamilton, Ontario, plus 55 miles of 6 to 20-in. laterals, and 317 miles of 2 to 12-in. distribution lines.

Status: Planned.

Completion: November 30, 1957.

Project: 17 miles of 8 to 20-in. storage lines in Dawn Township, Ontario.

Status: Planned.

Completion: August 1957.

Union of Soviet Socialist Republic.

Project: 900 miles of 26-in. from Stavropol in the Northern Caucasus to Moscow. The line, larger than Russia's other two major gas lines which are only 16 and 18-in., will serve Voroshilovgrad, Voronezh, Tula, Yelets, and Serpukhov.

Status: Under way; over 50 per cent completed.

• **Westcoast Transmission Co., Ltd.**

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way. About two-thirds completed.

Contractors: **Dutton-Williams Brothers, Ltd.**, has 120 miles from Taylor, B. C., to Azouzetta Lake, completed; **Universal Pipe Lines, Ltd.**, subsidiary of **Mannix, Ltd.**, has 110 miles between Huntingdon and Kingsvalle, B. C. F. L. Byers, spread superintendent, office at Hops, B. C.; **Canadian Bechtel, Ltd.**, has 210 miles from Alexandria to Pine Pass, B. C. H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.**, has 210 miles; **River Construction Corp., Ltd.**, has under way 150 miles of gathering lines in northern Alberta and British Columbia; **Marine Pipeline & Dredging, Ltd.**, has Fraser and Peace River crossings, Waldo Trim, spread superintendent, offices at Fort Saint John and Hope, B. C.

Completion: Dutton-Williams section completed. R. A. Conyes section and Canadian Bechtel section to be completed September 1957. Marine Pipeline work to be completed June 30, 1957. Universal Pipe Lines, Ltd. will complete work September 1, 1957.

Project: 174 miles of 30-in. from Savanna Creek area to the Canadian-Idaho border.

Status: Proposed.

• **Yacimientos Petroliferos Fiscales (Argentina)**

Project: 1,056 miles from Campo Duran to Buenos Aires.

Status: Proposed. Bids will be taken beginning the end of January 1957.

ROCKY MOUNTAIN

MONTANA

Winnipeg Cored at Sheridan Wildcat

The Winnipeg-Ordovician was topped at 10,097 ft. at Amerada Petroleum Corp.'s 1 Loucks, Outlook area confirmation try in C NE SW 35-36n-52e, Sheridan County, northwestern Montana. The operator is coring at 10,191 ft.

This wildcat has recovered oil in the Red River-Ordovician. The pay at the Outlook discovery well is the Silurian. Location is 4 miles southwest of the field discovery well. The other Amerada well in the area, 1 Ruegsegger, C NE NE 24-36n-52e, 2 miles northwest of Outlook field, is drilling below 7,390 ft. in the Lodgepole.

NORTH DAKOTA

Testing Continues at State's Deepest Producer

Amerada's deep discovery prospect in Beaver Lodge field, Williams County, flowed 170 bbl. of condensate, 1 bbl. of water, and 5,795 M.c.f. of gas in 14 hours. The 1 Iverson-Nelson, NW SE NE 2-155n-96w, is testing perforations at 12,696-12-784 ft.

WESTERN NEBRASKA

Year's Record New Locations Staked

The biggest number of new locations in this section this year were announced last week. Kimball County accounted for 17 of the 30 new wells planned for western Nebraska; Baner County will get 6, Cheyenne 3, Dawes, Norill, Sioux, and Garden, 1 each. Of the 30 locations, 16 will be wildcats.

LEGAL

SEALED BIDS will be received until 2:00 p.m. Central Standard Time, March 27, 1957, and opened at that time in the office of the Superintendent of the Standing Rock Indian Agency, Fort Yates, North Dakota for the leasing of 27,409.00 acres of Tribal land and 960.00 of allotted Indian land, located in the following townships and ranges, situated within Corson County, South Dakota, for oil and gas mining purposes. T. 18 N., R. 19 E., Black Hills Meridian; T. 18 N., R. 20 E., Black Hills Meridian; T. 18 N., R. 21 E., Black Hills Meridian; T. 18 N., R. 22 E., Black Hills Meridian; T. 19 N., R. 18 E., Black Hills Meridian. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Superintendent of the Standing Rock Indian Agency, Fort Yates, North Dakota, or by a telephone call to No. 2341, Fort Yates, North Dakota.

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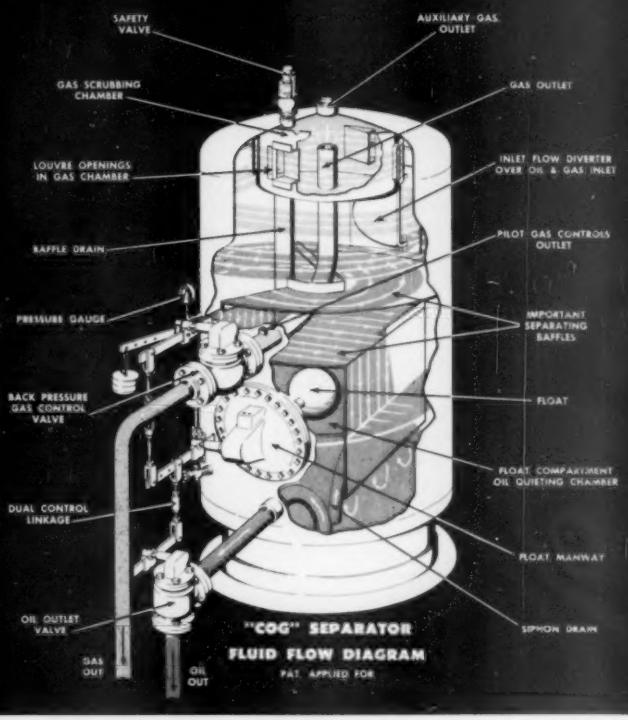
Youngstown Sheet and Tube Company Inside Back Cover

NATIONAL "COG"* SEPARATORS DO THE JOB

IT'S WHATS IN A SEPARATOR THAT COUNTS



"COG" SEPARATOR
FLUID FLOW DIAGRAM
PAT. APPLIED FOR

FOR MAXIMUM CONSERVATION OF OIL AND GAS

FLOW DESCRIPTION

The incoming well fluid enters the separator through a specially designed extra heavy cast steel diverter that turns the well fluid against the circular side walls of the separator, thus giving the incoming fluid centrifugal motion. An adequate side wall wear plate at the inlet prevents wall erosion.

OIL STREAM

The oil travels circumferentially about the separator in a relatively thin film, thereby presenting a larger surface from which the entrained gas is "broken out." This larger oil surface contributes toward greater oil capacities. The greater the fluid volume at the inlet, the greater the initial fluid velocity and the longer the scrubbing travel against the side wall of the separator; that is, the higher the jet velocity at the inlet, the farther the fluid will travel around the side wall of the separator before coming in contact with the first horizontal baffle plate.

Here the liquid continues to be spread in a thin film forcing more gas to be liberated, then the liquid cascades from the first horizontal baffle plate down to the top of the quieting chamber to continue its travel in a thin film. The liquid flows over the quieting chamber roof and side wall. Note that oil is collected outside of the quieting chamber and has further opportunity to liberate entrained gas. The oil in this chamber containing the least entrained gas is drawn off the bottom and flows under the baffle into the final quieting chamber. The oil is withdrawn from the bottom of the separator through a siphon oil outlet.

Free gas is prevented from entering the quieting chamber which assists greatly in producing early equilibrium at the separator pressure. The quieting chamber provides a relatively quiet surface within the separator on which the float rides thus conveying smooth action to the oil valve actuating equipment.

GAS STREAM

The gas stream, after initial or inlet separation, travels a well designed tortuous path, such that proper velocities are maintained through the gas scrubbing stages. The gas stream undergoes centrifugal scrubbing against the separator shell, against the outer surface of the gas chamber and through numerous louvre openings in the chamber wall as it enters the chamber. Inside the chamber it is further scrubbed on the inner walls. The oil that is entrained with the gas is drained away from the scrubbing gas stream through the drain pipe to the quieting chamber.

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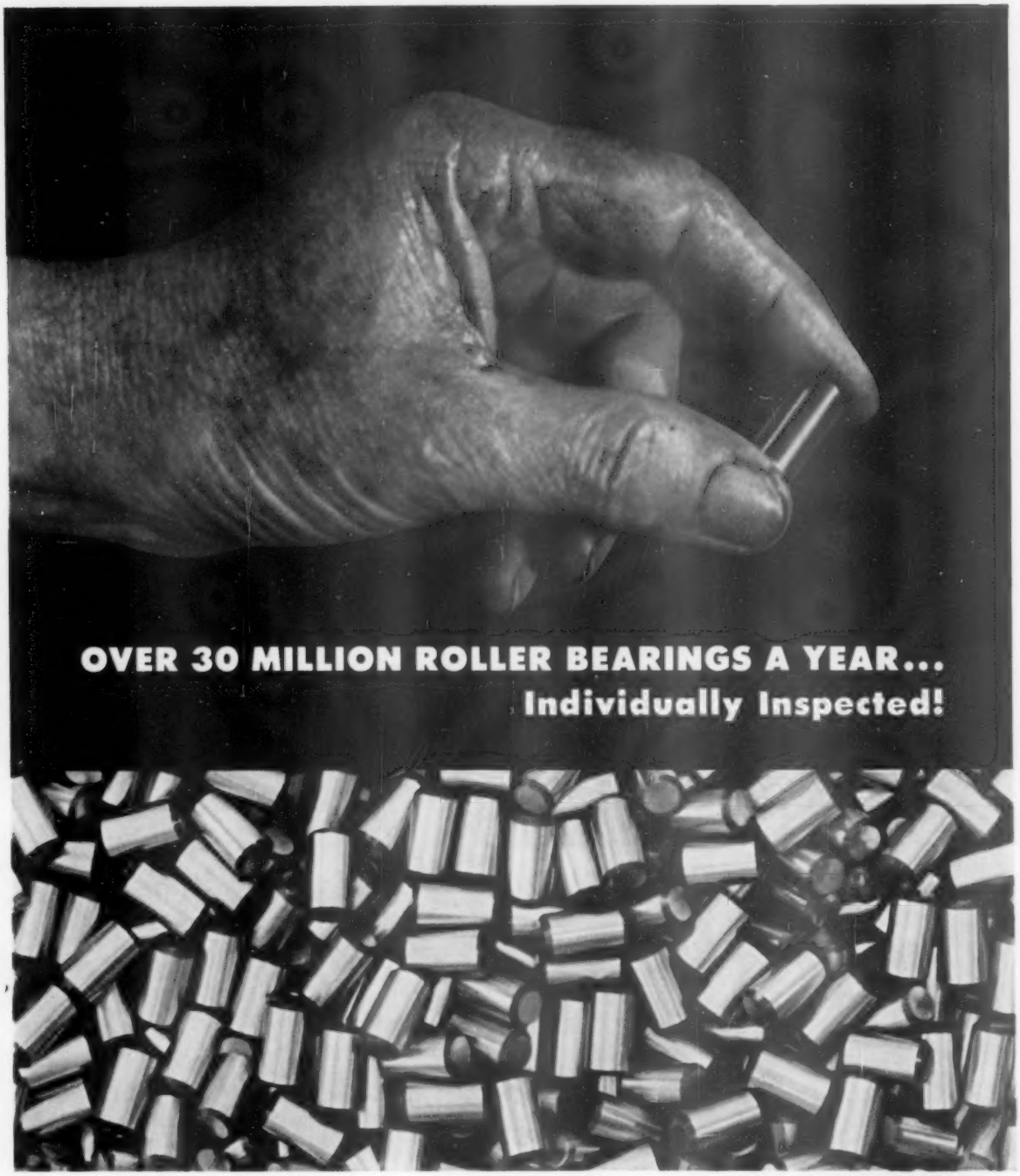

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